LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA23-26 | Balsall Common to Curzon Street

Ecological baseline data: invertebrates and fish (EC-004-004)

Ecology

November 2013

VOL 5

ES 3.5.2.23-26.4

LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA23-26 | Balsall Common to Curzon Street

Ecological baseline data: invertebrates and fish (EC-004-004)

Ecology

November 2013

Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

A report prepared for High Speed Two (HS2) Limited.

High Speed Two (HS2) Limited,
Eland House,
Bressenden Place,
London SW1E 5DU

Details of how to obtain further copies are available from HS2 Ltd.

Telephone: 020 7944 4908

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

High Speed Two (HS2) Limited has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the HS2 website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact High Speed Two (HS2) Limited.

Printed in Great Britain on paper
containing at least 75% recycled fibre.

Appendix EC-004-004

Environmental topic:	Ecology	EC
Appendix name:	Ecological baseline data (CFA 23, CFA24, CFA25 and CFA26) invertebrates, crayfish and fish	004-004
Community forum areas:	West Midlands Met	254

Contents

List of tables

1 Introduction

1.1.1 This document is an appendix which forms part of Volume 5 of the environmental statement (ES) for the Proposed Scheme. It details ecological baseline data collected for the following community forum areas (CFA):

- CFA23: Balsall Common and Hampton-in-Arden;
- CFA24: Birmingham Interchange and Chelmsley Wood;
- CFA25: Castle Bromwich and Bromford; and
- CFA26: Washwood Heath to Curzon Street.

1.1.2 The document should be read in conjunction with Volume 2 (Community forum area reports), Volume 3 (Route wide effects) and Volume 4 (Off-route effects).

2 Terrestrial invertebrates

2.1 Introduction

2.1.1 This section of the appendix presents a summary of baseline data relating to terrestrial invertebrates for the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive.

2.2 Methodology

2.2.1 Details of the standards for terrestrial invertebrate survey are provided in Ecology Technical Note: Ecological field survey methods and standards (Volume 5: Appendix CT-001-000/2). The methods employed were sweep netting, aerial netting and hand searching of suitable habitats. All surveys were undertaken between May and September.

2.2.2 Target families for invertebrate survey were Syrphidae (hoverflies), Empipidae (empid flies), Dolichopodidae (stilt-legged flies), Rhagionidae (snipe flies), Stratiomyiidae (soldierflies), Asilidae (robberflies), Tephritidae (picture-winged flies), Chrysomelidae (leaf beetles), Orthoptera (grasshoppers), Carabidae (ground beetles), Staphylinidae (excluding Aleocharinae) (rove beetles) and all families of Heteroptera (true bugs), Homoptera (Auchenorrhyncha) (plant hoppers) and Curculionoidea (weevils). These groups were selected on the basis that they meet the following criteria, they:

- are typical of the habitat types present within the land required for the construction of the Proposed Scheme;
- occupy a broad range of ecological niches;
- are groups with well documented ecology and distribution;
- support a number of species of conservation significance; and
- are taxonomically stable, with English Language keys for identification to species level.

2.2.3 Desk study records relating to terrestrial invertebrates were obtained from Warwickshire Biological Record Centre[1] and EcoRecord[2].

2.3 Deviations, constraints and limitations

2.3.1 Two sites were scoped for survey but were contained within areas subject to access restrictions: one within the Balsall Common and Hampton-in-Arden area (CFA23) (south-west of Berkswell Marsh SSSI) and the other within the Washwood Heath to Curzon Street area (CFA26) (at Washwood Heath). Based upon aerial photography and reports from scoping surveys undertaken, these sites appear to support habitats of value including; areas of semi natural vegetation showing significant visual

[1] Warwickshire Biological Records Centre; Warwickshire Museum; http://heritage.warwickshire.gov.uk/ecology/data-and-ecological-records/warwickshire-biological-records-centre/; accessed April 2012
[2] EcoRecord is the biological record centre for Birmingham and the Black Country (Dudley, Sandwell, Walsall & Wolverhampton).
[2] EcoRecord; The Ecological Database for Birmingham and the Black Country; http://www.ecorecord.org.uk/?q=home; contacted April 2012.

heterogeneity, complex associations (mosaics) of two or more habitat types, complex gradients between two visually discernible habitat types, extensive vegetated margins to identifiable open water bodies and vegetation developed on post-industrial ground. These habitats will provide for a range of invertebrate species.

2.3.2 Of the eight sites subject to terrestrial invertebrate survey, none received a late summer/early autumn visit in 2012 due to poor weather. Land west of Meriden Mill Farm (040-IT1-154001) received three visits: on the 04 June 2013, 17 May 2013 and a later summer visit on 10 July 2013. All other sites were subject to two survey visits, with the exception of Park Hall Site of Importance for Nature conservation (SINC) which received one visit, as the field survey was unlikely to provide a better data set than that already available from desk study.

2.3.3 Butterfly species were to be the subject to a separate survey, using direct observation only; however habitats of a type and extent likely to support butterflies of conservation importance were not identified within this section.

2.3.4 Due to the low number of species of conservation importance encountered within the surveys, and the reduced number of surveys undertaken, entry and analysis of data via the ISIS database was not considered a suitable method for the determination of conservation value of the sites surveyed.

2.4 Baseline

2.4.1 Table 1 provides a summary of those sites that were subject to initial scoping surveys, and were found not to warrant further detailed survey.

Table 1: Sites scoped out of requirement for further terrestrial invertebrate survey

Map code	Survey site/location	OS grid reference	Description of proposed site and rationale for scoping out requirement for further survey	Survey date	CFA
EC-11-100b-C6	Beechwood Farm	SP 253 772	From aerial photographs the area appeared to comprise a variety of habitat types, and so was proposed for survey. The initial visit showed the habitats to be equally well represented in other nearby survey locations, such as 040-IT1-147001 and 040-IT1-148001. The area did not have any unique characteristics likely to support assemblages of significant terrestrial invertebrates.	04 July 2012	23
EC-11-135-C4	Land north of Park Hall SINC	SP 157 911	Aerial photography indicated that parts of the site supported habitat which was not represented elsewhere nearby; the initial site walkover identified this habitat to consist of young, even aged willow coppice, of limited interest for invertebrates and unlikely to have supported terrestrial invertebrate species or assemblages of particular ecological value.	04 June 2013	25

2.4.1 Table 2 provides a summary of those sites that were subject to terrestrial invertebrate survey.

Table 2: Sites subject to terrestrial invertebrate survey

Ecology survey code	Survey site/location	OS grid reference	Survey date	CFA	Distance from land required for the construction of the Proposed Scheme[3] (m)
040-IT1-147001	Land north of Waste Lane	SP 252 769	04 July 2012; 11 July 2013	23	Within land required
040-IT1-148001	Land south of Berkswell station	SP 246 772	04 August 2012; 10 July 2013	23	Within land required
040-IT1-153001	Patrick Farm Meadow	SP 214 817	21 May 2013; 04 June 2013	23	Within land required
040-IT1-154001	Land west of Meriden Mill Farm	SP 218 820	17 May 2013; 04 June 2013; 10 July 2013	23	Within land required
040-IT1-156001	Park Farm	SP 205 836	04 June 2013; 11 July 2013	24	Within land required
040-IT1-158001	Coleshill & Bannerly Pools SSSI	SP 199 859	22 May 2012; 05 June 2013	24	Within land required
040-IT1-165001	Land east of Park Hall SINC	SP 164 909	04 June 2013; 17 June 2013	25	Within land required
040-IT1-165002	Park Hall SINC	SP 154 907	18 June 2012	25	Within land required

2.4.2 Table 3 provides a summary of invertebrate species of conservation significance identified within CFA23 CFA24, CFA25 and CFA26 inclusive.

Table 3: Protected and/or notable invertebrate species identified during terrestrial invertebrate survey in CFA23, CFA24, CFA25 and CFA26 inclusive.

Ecology survey code	Scientific name	Status	Survey site/location	OS grid reference	Habitat	Survey date	CFA
040-IT1-156001	*Notaris scirpi*	Notable B	Park Farm	SP 205 837	Marshy grassland and riparian margins	04 June 2013	24

Nationally Scarce = Nationally scarce (Notable) species have been recorded in 16-100 10km squares and are further subdivided into Notable A (16-30 10km squares) and Notable B (31-100 10km squares) (Hyman, 1992 and 1994)4

2.4.3 Table 4 provides a summary of invertebrate species of conservation significance identified from desk study records within CFA23, CFA24, CFA25 and CFA26 inclusive.

Table 4: Protected and/or notable invertebrate species identified from desk study records in CFA23, CFA24, CFA25 and CFA26 inclusive

Scientific name	Status	Location	OS grid reference	Record date	CFA
Lasiommata megera (Nymphalidae)	SPI	Marsh Lane Nature Reserve	SP 219 800	04 August 2000	23
Coenonympha pamphilus (Nymphalidae)	SPI	Blackfirs Lane, south-west of Coleshill Pool Wood Local Wildlife Site	SP 190 852	20 May 2009; 26 May 2009; 28 May 2009	24

[3]The phrase 'Within land required' represents an abbreviation of this term
[4] Hyman, P.S., (1992), *A review of the scarce and threatened Coleoptera of Great Britain. Part I.* Joint Nature Conservation, Peterborough.

Scientific name	Status	Location	OS grid reference	Record date	CFA
		(LWS)			
Tyria jacobaeae (Arctiidae)	SPI	Park Hall SINC	SP 157 908	13 June 2006	25
T.jacobaeae (Arctiidae)	SPI	Park Hall SINC	SP 154 907	06 July 2011	25
Limnophila pictipennis (Limoniidae)	Red List GB Pre94 - Vulnerable	Park Hall SINC	SP 159 908	28 August 2008	25
Macrocera fascipennis (Mycetophilidae)	Nationally Scarce	Park Hall SINC	SP 157 908	30 August 2008	25
Piezura graminicola (Fanniidae)	Red List GB Pre94 - Insufficient data	Park Hall SINC	SP 153 906	16 July 2008	25
Aulacobaris lepidii (Curculionoidea)	Nationally Scarce (Notable A)	Park Hall SINC	SP 157 908	06 September 2006	25
Anagnota bicolor (Anthomyzidae)	Nationally Scarce	Park Hall SINC	SP 157 908	30 August 2008	25
Colobaea bifasciella (Coleoptera)	Nationally Scarce	Park Hall SINC	SP 157 908	25 August 2008	25
Crudosilis ruficollis (Cantharidae)	Nationally Scarce (Notable B)	Park Hall SINC	SP 157 908	25 June 2008	25
Dioxyna bidentis (Tephritidae)	Nationally Scarce	Park Hall SINC	SP 157 908	28 August 2008	25
Lejogaster tarsata (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 157 908	16 July 2008	25
L.tarsata (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 153 907	25 June 2008	25
L.tarsata (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 159 908	29 June 2007; 19 July 2007	25
Neoascia interrupta (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 157 908	14 May 2008	25
N.interrupta (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 153 907	14 May 2008	25
N.interrupta (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 159 908	14 May 2008	25
N.scirpi (Curculionoidea)	Nationally Scarce (Notable B)	Park Hall SINC	SP 159 908	29 July 2008	25
Odontomyia tigrina (Stratiomyidae)	Nationally Scarce	Park Hall SINC	SP 157 908	24 May 2007	25
O.tigrina (Stratiomyidae)	Nationally Scarce	Park Hall SINC	SP 159 908	25 June 2008	25
Orthonevra brevicornis (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 164 910	03 May 2007	25
Phaonia atriceps (Muscidae)	Nationally Scarce	Park Hall SINC	SP 157 908	19 July 2007; 14 May 2008; 16 July 2008; 25 August 2008	25

Scientific name	Status	Location	OS grid reference	Record date	CFA
P.atriceps (Muscidae)	Nationally Scarce	Park Hall SINC	SP 159 908	19 July 2007; 29 June 2007; 25 June 2008; 19 June 2008	25
P.atriceps (Muscidae)	Nationally Scarce	Park Hall SINC	SP 162 910	14 May 2008	25
Pilaria scutellata (Limoniidae)	Nationally Scarce	Park Hall SINC	SP 159 908	29 July 2008	25
Psacadina verbekei (Sciomyzidae)	Nationally Scarce	Park Hall SINC	SP 157 908	05 July 2006; 25 June 2008; 19 June 2008	25
Sapromyza opaca (Lauxaniidae)	Nationally Scarce	Park Hall SINC	SP 159 908	29 July 2008	25
Scathophaga decipiens (Scathophagidae)	Nationally Scarce	Park Hall SINC	SP 157 908	16 July 2008	25
Sciomyza simplex (Sciomyzidae)	Nationally Scarce	Park Hall SINC	SP 153 907	28 August 2008	25
Stratiomys singularior (Stratiomyidae)	Nationally Scarce	Park Hall SINC	SP 159 908	29 July 2008	25
Thaumastoptera calceata (Limoniidae)	Nationally Scarce	Park Hall SINC	SP 153 906	25 June 2008	25
Typhamyza bifasciata (Anthomyzidae)	Nationally Scarce	Park Hall SINC	SP 157 908	30 August 2008	25
Volucella inanis (Syrphidae)	Nationally Scarce	Park Hall SINC	SP 153 906	28 August 2008	25
Amara (Celia) praetermissa (Carabidae)	Nationally Scarce (Notable B)	Grand Union Canal Site of Local Importance for Nature Conservation (SLINC)	SP 081 868	27 April 2005; 01 September 2005	26
Aulogastromyia anisodactyla (Lauxaniidae)	Nationally Scarce	Queensway, north-west of the proposed Curzon Street station	SP 075 869	01 September 2005; 25 July 2006	26
A.anisodactyla (Lauxaniidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 876	14 May 2004; 01 August 2005; 17 August 2005; 01 September 2005; 23 August 2007	26
Ceutorhynchus punctiger (Curculionidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 875	11 May 2004	26
Chetostoma curvinerve (Tephritidae)	Red List GB Pre94 - Endangered	Grand Union Canal SLINC	SP 081 868	27 July 2007	26
Chiasmia clathrata	SPI	Grand Union Canal	SP 080 875	18 May 2004;	26

Scientific name	Status	Location	OS grid reference	Record date	CFA
(Geometridae)		SLINC		25 May 2004; 03 June 2004; 17 June 2005; 28 June 2005; 08 June 2006	
Chorisops nagatomii (Stratiomyidae)	Nationally Scarce	Queensway, north-west of the proposed Curzon Street station	SP 075 869	01 September 2005; 23 August 2007	26
C.nagatomii (Stratiomyidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 869	23 August 2007	26
C.nagatomii (Stratiomyidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 873	01 September 2005	26
C.nagatomii (Stratiomyidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 868	01 September 2005	26
C.nagatomii (Stratiomyidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 876	01 September 2005; 23 August 2007	26
Cleptes semiauratus (Chrysididae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 869	17 June 2005; 28 June 2005	26
Cnemacantha muscaria (Lauxaniidae)	Red List GB Pre94 - Rare	Grand Union Canal SLINC	SP 080 875	17 June 2005	26
Coenosia stigmatica (Muscidae)	Red List GB Pre94 - Rare	Grand Union Canal SLINC	SP 081 868	26 May 2006	26
Crossocerus (Crossocerus) distinguendus (Crabonidae)	Nationally Scarce (Notable A)	Queensway, north-west of the proposed Curzon Street station	SP 075 869	09 August 2007	26
C.distinguendus (Crabonidae)	Nationally Scarce (Notable A)	Grand Union Canal SLINC	SP 080 869	28 June 2007	26
C.distinguendus (Crabonidae)	Nationally Scarce (Notable A)	Grand Union Canal SLINC	SP 081 873	01 August 2005; 27 July 2007; 28 June 2007; 29 June 2006	26
C.distinguendus (Crabonidae)	Nationally Scarce (Notable A)	Grand Union Canal SLINC	SP 080 875	29 June 2006; 27 July 2007	26
Curculio rubidus (Curculionoidea)	Nationally Scarce (Notable B)	Birmingham and Fazeley Canal, north-west of Nechells Green	SP 081 871	23 August 2007	26
Ectemnius (Clytochrysus) ruficornis (Crabronidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 875	23 August 2007	26

Scientific name	Status	Location	OS grid reference	Record date	CFA
Fannia pseudonorvegica (Fanniidae)	Red List GB Pre94 - Insufficient data	Grand Union Canal SLINC	SP 080 875	05 May 2005	26
Fiebrigella palposa (Chloropidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 875	22 September 2005	26
Homoneura tesquae (Lauxaniidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 875	22 August 2007	26
Hylaeus (Prosopis) signatus (Colletidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 869	24 May 2004	26
H.signatus (Colletidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 081 868	14 July 2005; 29 June 2006; 08 June 2006; 28 June 2007	26
H.signatus (Colletidae)	Nationally Scarce (Notable B)	Curzon Street	SP 078 873	08 June 2006	26
H.signatus (Colletidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 875	01 August 2005; 14 July 2005; 17 June 2005; 29 June 2006	26
Lasioglossum (Dialictus) leucopus (Halictidae)	Red List GB Pre94 - Rare	Grand Union Canal SLINC	SP 080 875	22 September 2005; 27 July 2007	26
Lasioglossum (Lasioglossum) quadrinotatum (Halictidae)	Nationally Scarce (Notable A)	Grand Union Canal SLINC	SP 080 875	05 May 2005	26
L.quadrinotatum (Halictidae)	Nationally Scarce (Notable A)	Curzon Street	SP 078 873	17 June 2005	26
Lonchaea palposa (Lonchaeidae)	Nationally Scarce	Queensway	SP 075 869	18 May 2004	26
Lonchaea peregrina (Lonchaeidae)	Nationally Scarce	Queensway	SP 075 869	05 May 2005	26
Longitarsus parvulus (Chrysomelidae)	Nationally Scarce (Notable A)	Queensway	SP 075 869	20 April 2004	26
Longitarsus pratensis (Curculionidae)	Red List GB Pre94 - Insufficient data	Grand Union Canal SLINC	SP 080 875	11 May 2004	26
Meligethes fulvipes (Nititulidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 868	11 May 2004	26
Meromyza sp. indet. (Chloropidae)	Indeterminate	Grand Union Canal SLINC	SP 081 868	29 June 2006	26
Meromyza sp. indet. (Chloropidae)	Indeterminate	Curzon Street	SP 078 873	25 July 2006	26
Meromyza sp. indet.(Chloropidae)	Indeterminate	Grand Union Canal SLINC	SP 080 876	29 June 2006	26

Scientific name	Status	Location	OS grid reference	Record date	CFA
Norellia spinipes (Scathophagidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 873	06 September 2007	26
N.spinipes (Scathophagidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 876	28 June 2007	26
N.spinipes (Scathophagidae)	Nationally Scarce	Queensway	SP 075 869	14 July 2005	26
Nysson trimaculatus (Nyssoninae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 081 868	06 September 2007	26
Philanthus triangulum (Crabronidae)	Red List GB Pre94 - Vulnerable	Curzon Street	SP 078 873	14 July 2005	26
P.triangulum (Crabronidae)	Red List GB Pre94 - Vulnerable	Grand Union Canal SLINC	SP 080 875	17 August 2005; 22 September 2005	26
Pipunculus zugmayeriae (Syrphidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 875	08 June 2006	26
Platyderus depressus (Carabidae)	Nationally Scarce (Notable B)	Birmingham and Fazeley Canal	SP 081 871	27 April 2005; 01 September 2005	26
P.depressus (Carabidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 081 868	20 April 2004; 27 April 2005; 01 September 2005	26
P.depressus (Carabidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 875	27 April 2005; 01 September 2005	26
P.depressus (Carabidae)	Nationally Scarce (Notable B)	Grand Union Canal SLINC	SP 080 876	27 April 2005; 01 September 2005	26
Polydrusus (Chrysophis) formosus (Curculionidae)	Nationally Scarce (Notable A)	Grand Union Canal SLINC	SP 080 876	18 May 2005	26
P.formosus (Curculionidae)	Nationally Scarce (Notable A)	Curzon Street	SP 078 873	12 July 2007	26
S.opaca (Lauxaniidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 875	17 August 2007	26
S.opaca (Lauxaniidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 868	12 July 2007	26
Sciophila fridolini (Mycetophilidae)	Red List GB 1994 - Data deficient	Grand Union Canal SLINC	SP 080 869	18 May 2005	26

Scientific name	Status	Location	OS grid reference	Record date	CFA
Solva marginata (Xylomyidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 876	12 July 2007	26
Trypeta zoe (Tephritidae)	Red List GB Pre94 - Endangered	Grand Union Canal SLINC	SP 080 869	14 May 2004; 24 May 2004; 18 May 2005	26
T.jacobaeae (Arctiidae)	SPI	Grand Union Canal SLINC	SP 081 868	28 June 2005	26
T.jacobaeae (Arctiidae)	SPI	Grand Union Canal SLINC	SP 080 875	25 May 2000; 03 June 2004; 08 June 2006	26
V.inanis (Syrphidae)	Nationally Scarce	Grand Union Canal SLINC	SP 081 868	17 August 2005	26
V.inanis (Syrphidae)	Nationally Scarce	Grand Union Canal SLINC	SP 080 875	01 August 2005	26

Key to designations: SPI = species of principal importance are listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006; Nationally Scarce = Nationally scarce (Notable) species have been recorded in 16-100 10km squares and are further subdivided into Notable A (16-30 10km squares) and Notable B (31-100 10km squares) (Hyman, 1992 and 1994)5. Red List GB Pre 1994 = GB list based on IUCN list, and classified as endangered, vulnerable, rare or insufficient data; Red List GB 1994 = GB list based on revised IUCN list; Indeterminate = Taxon only identified to Genus so status cannot be determined as lists are to species level.

Balsall Common and Hampton-in-Arden (CFA23)

Land north of Waste Lane

2.4.4 Field surveys at 040-IT1-147001 identified 33 terrestrial invertebrate species from the families targeted in surveys. The species recorded were all common and widespread, and typical of the habitat types present within the surveyed areas. The assemblages recorded were characteristic of those expected of open dry and wet grassland habitats with rank vegetation and which were lacking features or specific habitat types required to support more specialised species.

Land south of Berkswell station

2.4.5 Field surveys at 040-IT1-148001 identified 27 terrestrial invertebrate species from the families targeted in surveys. All of the species recorded were common and widespread and typical of the damp/marsh vegetation and tree and scrub habitats present. The assemblages recorded reflected the characteristics of the habitats present in that they were not of a type, extent or quality capable of supporting a significant community of specialist species with specific habitat requirements.

Patrick Farm Meadow

2.4.6 Field surveys at 040-IT1-153001 identified 25 terrestrial invertebrate species from the families targeted in surveys. All of the species recorded were common and widespread, typical of the marshy to dry grassland and hedgerow habitats present. The assemblages recorded reflected the characteristics of the habitats present in that

[5] Hyman, P.S., (1992), *A review of the scarce and threatened Coleoptera of Great Britain. Part I.* Joint Nature Conservation, Peterborough.

they were not of a type, extent or quality capable of supporting a significant community of specialist species with specific habitat requirements.

Land west of Meriden Mill Farm

2.4.7 Field surveys at 040-IT1-154001 identified 29 terrestrial invertebrate species from the families targeted in surveys. The species recorded were typical of the marshy and open water habitats present on the site. Some of the species recorded were of local distribution, including the fly *Dolichopus latelimbatus* and the rove beetle *Hypostenus tarsalis*, which indicated that the habitats on the site had some features which were capable of supporting specialist species that are not commonly distributed within the wider countryside. These features related primarily to the marginal habitats around the edges of water bodies with fluctuating water levels. This site falls within the land required for the construction of the Proposed Scheme.

2.4.8 Desk study provided details of one notable species within this area. The wall butterfly (*L. megera*) was found at Marsh Lane Nature Reserve. It is a species of principal importance, on the basis that population numbers have declined significantly over the last 25 years. This is a grassland species, typical of open areas, occurring less frequently in inland habitats. The records of this species were over 100m from the land required for the construction of the Proposed Scheme.

Birmingham Interchange and Chelmsley Wood (CFA24)

Park Farm

2.4.9 Field surveys at 040-IT1-156001 identified 42 terrestrial invertebrate species from the families targeted in surveys, including one nationally notable species (*N.scirpi*). The species recorded were typical of the marshy and riparian marginal habitats present on the site. Some of the species recorded were of local distribution, such as the leaf beetle *Chalcodes plutus* and the weevil *Cionus tuberculosus* which indicated that the habitats on the site had some features which were capable of supporting specialist species which are not commonly distributed within the wider countryside, such as *N.scirpi*. These features related primarily to the diverse vegetation of the marginal habitats along Hollywell Brook, which lies within the land required for the construction of the Proposed Scheme and extends to beyond the 100m survey area boundary.

Coleshill & Bannerly Pools SSSI

2.4.10 Field surveys at 040-IT1-158001 identified 27 terrestrial invertebrate species from the families targeted in surveys. The species recorded were typical of the woodland and water edge habitats present on the site. Some of the species recorded were of local distribution, such as the wasp *Priocnemus peturbator* which reflected the characteristics of the habitats present in that they had some features capable of supporting specialist species not commonly distributed within the wider countryside. The species concerned appeared to be associated with marginal habitats surrounding the areas of open water in this location, which lie over 100m from the land required for the construction of the Proposed Scheme.

2.4.11 The Desk study provided details of one important species within the Birmingham Interchange and Chelmsley Wood area (CFA24). The small heath butterfly

(*C.pamphilus*), is a species of principal importance on the basis that population numbers have declined significantly over the last 25 years. This is a grassland species, typical of open areas and was recorded over 300m from the land required for the construction of the Proposed Scheme. Habitats within the land required for the construction of the Proposed Scheme are largely unsuitable for this species.

Castle Bromwich and Bromford (CFA25)

Land east of Park Hall SINC

2.4.12 Field surveys at 040-IT1-165001 identified 10 common and widespread terrestrial invertebrate species from the families targeted in surveys. The species recorded were typical of the grassland and scrub habitats present in this location. The assemblages recorded reflected the characteristics of the habitats present in that they were not of a type, extent or quality capable of supporting a significant community of specialist species with specific habitat requirements.

Park Hall SINC

2.4.13 A field survey at 040-IT1-165002 identified 30 terrestrial invertebrate species from the families targeted in surveys. The species recorded were generally common and widespread and characteristic of the marsh, grassland and woodland habitats present in this location. However, the extent and type of habitats present appeared capable of supporting a diverse invertebrate fauna.

2.4.14 Desk study records from Park Hall SINC included records of one species of Principal Importance, two GB Red List species; *Limnophila pictipennis* and *Piezura graminicola* with the latter also listed as vulnerable on the pre-1994 list and 21 nationally scarce species, two of which were notable B and one of which was notable A. The majority of species of conservation importance recorded from within this site occur in wetland habitats within the area required for the construction of the Proposed Scheme.

Washwood Heath to Curzon Street (CFA26)

2.4.15 No field surveys were undertaken in the Washwood Heath to Curzon Street area (CFA26) due to land access constraints.

2.4.16 The desk study data included records of two species of principal importance, 24 nationally scarce species (eight of which were notable B and four of which were notable A), one 1994 GB Red List species and eight pre-1994 GB Red List species (two of which are listed as endangered, one as vulnerable and three as rare). These all originated from within the Birmingham canal system and indicated that the marginal vegetation of these canals supported a range of insects of conservation importance. The area of canal within the land required for the construction of the Proposed Scheme has limited marginal vegetation and the majority of species recorded are unlikely to be dependent on this area. However, the area does support scrub and grassland habitats which may be used by adults of some of the recorded species of beetles and true flies such as *Longitarsus parvulus* (Chrysomelidae) and *Chorisops nagatomii* (Stratiomyidae) which are Notable A and Nationally Scare respectively.

Summary

2.4.17 The terrestrial invertebrate surveys undertaken within the study area, identified assemblages of limited nature conservation interest with regard to terrestrial invertebrates. Communities of invertebrates, characterised by selected families, were identified in the Balsall Common and Hampton-in-Arden area (CFA23), the Birmingham Interchange and Chelmsley Wood area (CFA24) and the Castle Bromwich and Bromford area (CFA25). Field surveys recorded one nationally notable species (*N.scirpi*).

2.4.18 Desk study records identified a number of notable species within the Castle Bromwich and Bromford area (CFA25) and the Washwood Heath to Curzon Street area (CFA26).

3 Aquatic invertebrates

3.1 Introduction

3.1.1 This section of the appendix presents details of baseline information relating to aquatic invertebrates that is relevant to the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive.

3.2 Methodology

3.2.1 Details of the standard methodology used for aquatic invertebrate survey are provided in Ecology Technical Note: Field survey methods and standards (Volume 5: Appendix CT-001-000/2).

3.2.2 Desk study records relating to aquatic invertebrates were obtained from the following sources:

- Environment Agency;
- Warwickshire Biological Records Centre[6];
- EcoRecord[7]; and
- SSSI citation for River Blythe.[8]

3.2.3 A summary of locations at which aquatic invertebrate surveys were undertaken within the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive, is provided in Table 5, and shown in Volume 5: Map series EC-12.

3.2.4 The field surveys included aquatic invertebrates sampled as part of pond, canal and ditch assessments (see Appendix EC-004-001, in which detailed habitat and plant survey data are provided).

3.2.5 Rivers were surveyed for invertebrates using standard river sampling methods as described in River InVertebrate Prediction And Classification Software (RIVPACS) guidance, while other elements of river habitats were surveyed using River Habitat Surveys and River Corridor Surveys, neither of which include sampling of invertebrates.[9]

3.2.6 The conservation values of invertebrates recorded have been assessed using Conservation Scores, following those given in Chadd and Extence (2004).[10] These scores are 1 (very common),2 (common), 3 (frequent), 4 (occasional), 5 (local), 6

[6] Warwickshire Biological Records Centre; Warwickshire Museum; http://heritage.warwickshire.gov.uk/ecology/data-and-ecological-records/warwickshire-biological-records-centre/; accessed April 2012.
[7] EcoRecord is the biological record centre for Birmingham and the Black Country (Dudley, Sandwell, Walsall & Wolverhampton).
[7] EcoRecord; The Ecological Database for Birmingham and the Black Country; http://www.ecorecord.org.uk/?q=home; contacted April 2012.
[8] Natural England, Site Name: River Blythe, Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended. www.english-nature.org.uk/citation/citation_photo/1001772.pdf, accessed: 2012
[9] Wright J.F., Sutcliffe D.W. and Furse M.T (eds) (2000) *Assessing the biological quality of fresh waters: RIVPACS and other techniques*, Freshwater Biological Association, Ambleside.
[10] Chadd, R. and Extence, C, (2004). *The conservation of freshwater macro-invertebrate populations: a community based classification scheme.* Aquatic Conservation: Marine and Freshwater. Ecosystems. 14: 597-624.

(regionally notable), 7 (notable), 8 (Red Data Book Rare), 9 (Red Data Book Vulnerable and 10 (Red Data Book 1, Endangered).

Table 5: Summary of aquatic invertebrate survey locations for CFA23, CFA24, CFA25 and CFA26 inclusive

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
040-IA1-148001	Land north of Labernum Farm and Waste Lane	Wet ditch, within a pasture field	13 September 2012	23	Within land required
040-IA1-148002	House at Beechwood Farm	Duck pond in farmhouse area	21 November 2012	23	50m, north-east
040-IA1-148003	Beechwood Farm	Vegetated wet ditch in pasture field	13 September 2012; 28 March 2013	23	Within land required
040-IA1-148004	Beechwood Farm	Large, vegetated pond in field	13 September 2012; 28 March 2013; 09 July 2013	23	Within land required
040-IA1-148005	Land south of Moat Farm and west of Beechwood Farm	Large duck pond with island at centre	21 November 2012	23	30m, north-east
040-IA1-148006	Land south of Berkswell Station	Vegetated ditch	14 August 2012	23	Within land required
040-IA1-148007	Land south of Berkswell Station	Small, vegetated, marsh in depression	14 August 2012; 28 March 2013; (dry on 09 July 2013)	23	Within land required
040-IA1-149001	Land at Moat House Farm, north of Truggist Lane and Berkswell Station	Bayleys Brook, slow flowing, silt dominated watercourse	14 August 2012	23	Within land required
040-IA1-149002	Land east of Lavender Hall Farm	Circular pond in fisheries (used for stocking)	14 August 2012	23	50m, south-west
040-IA1-149003	Land on north side of Truggist Lane	Vegetated pond in grazed pasture field	11 October 2012	23	Within land required
040-IA1-149004	Land on north side of Truggist Lane	Circular, vegetated pond in grazed pasture field	11 October 2012	23	30m, north-east
040-IA1-149005	Land east of Lavender Hall Farm	Triangular pond in fisheries (used for stocking)	14 August 2012	23	Within land required
040-IA1-149006	Moat House Farm, west of Baulk Lane	Ditch (tributary of Bayleys Brook). Shaded ditch (hedgerow), with little aquatic vegetation	13 September 2012	23	40m, north-east

[11]The phrase 'Within land required' represents an abbreviation of this term

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
040-IA1-149007	Moat House Farm, west of Baulk Lane	Pond with island in centre, with little vegetation	13 September 2012	23	20m, north-east
040-IA1-149008	Moat House Farm south of Lavender Hall Lane and north of Baulk Lane	Shallow, vegetated pond	08 May 2013	23	50m, north-east
040-IA1-150001	North-west of Lavender Hall Lane	Small, vegetated, ovoid pond	08 May 2013	23	20m, south-west
040-IA1-150002	North-west of Lavender Hall Lane	Small, shaded pond in wooded area	11 October 2012	23	Within land required
040-IA1-150003	North-west of Lavender Hall Lane	Vegetated marshy pond, with some area of open water	11 October 2012	23	Immediately adjacent to land required
040-IA1-150004	Land at junction between Park Lane and A452	Ornamental pond in private house	11 October 2012	23	10m, south-west
040-IA1-152001	Land at roundabout north of Bradnocks Marsh Lane	Vegetated pond fed by road runoff (balancing pond)	04 June 2013	23	30m, south-west
040-IA1-153001	Horn Brook at Hornbrook Farm	Small ditch	03 June 2013	23	50m, south east
040-IA1-153002	Marsh Lane Nature Reserve	Vegetated, deep pond with rich floral diversity	06 September 2012	23	40m, south-west
040-IA1-153003	Horn Brook at Hornbrook Farm	Small ditch	03 June 2013	23	70m, north-east
040-IA1-153004	Marsh Lane Nature Reserve	'Dragonfly Pond', shallow, vegetated pond	05 September 2012; 28 March 2013; 09 July 2013	23	20m, south-west
040-IA1-153005	River Blythe Bypass at Marsh Lane Nature Reserve	Wet ditch, heavily shaded	06 September 2012	23	Within land required
040-IA1-153006	Land east of A452 and west of Hornbrook Farm	Ponded ditches in woodland, complex of several channels	09 May 2013	23	Within land required
040-IA1-153007	River Blythe Bypass on the land west of A452 and south of Meriden Road	Wet ditch	05 September 2012	23	10m, north-east
040-IA1-153008	River Blythe Bypass on the land west of A452 and south of Meriden Road	Fast flowing ditch	05 September 2012; 03 June 2013	23	160m, north-east
040-IA1-	Land west of A452 and south of	River Blythe SSSI (Location	05 September 2012;	23	Within land required

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
153009	Meriden Road	2 – riffle	09 May 2013		
040-IA1-153010	Land west of A452 and south of Meriden Road	Wet ditch	05 September 2012	23	40m, south-west
040-IA1-154001	Land west of A452 and north of Meriden Road	Wet ditch in field	05 September 2012	23	100m, north-east
040-IA1-154002	Land west of A452 and north of Meriden Road	Temporary pond, shallow	05 September 2012	23	40m, north-east
040-IA1-154003	Land west of A452 and north of Meriden Road	Large pond in pasture field	03 June 2013	23	140m, north-east
040-IA1-154004	Land west of A452 and north of Meriden Road	River Blythe SSSI (Location 1 – glide/pool)	05 September 2012; 09 May 2013	23	Within land required
040-IA1-154005	Land west of A452 and north of Meriden Road	Small, rectangular, shallow pond in River Blythe SSSI flood plain	03 June 2013	23	Within land required
040-IA1-154006	Land west of A452 and north of Meriden Road	Small, temporary, rectangular and shallow pond near to River Blythe SSSI	03 June 2013	23	Within land required
040-IA1-154007	Land west of A452 and north of Meriden Road	Shallow, small, rectangular pond in River Blythe SSSI flood plain	03 June 2013	23	Within land required
040-IA1-154008	Land west of A452 and north of Meriden Road	Small wet patch within tree-shaded depression	03 June 2013	23	Within land required
040-IA1-155001	Land west of A452 and north of Meriden Road	Shadow Brook	12 October 2012; 27 March 2013	23	Within land required
040-IA1-155002	Pasture Farm	Pond in garden	12 October 2012	23	100m, south-west
040-IA1-156001	East of Middle Bickenhill Lane	Hollywell Brook	10 October 2012	24	Within land required
040-IA1-156002	Near Packington Lane	Fairly fast flowing stream in woodland. Tributary of River Blythe SSSI	06 June 2013	24	20m, north-east
040-IA1-156003	Near Packington Lane	Vegetated pond with small wet patch within depression	10 October 2012	24	Within land required
040-IA1-156004	West of Middle Bickenhill Lane	Pond on Hollywell Brook	10 June 2013	24	Within land required

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
040-IA1-156005	Near Packington Lane	Shaded pond in depression within pasture field/meadow in woodland	10 October 2012	24	Within land required
040-IA1-156006	Pendigo Lake	Large pool/lake with Canadian geese population	06 June 2013	24	Within land required
040-IA1-157001	West of A452 and north of Middle Bickenhill Lane	Small, vegetated pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157002	West of A452 and north of Middle Bickenhill Lane	3 connected ponds on historic ditch line (approx. 350m^2)	06 June 2013	24	Within land required
040-IA1-157003	West of A452 and north of Middle Bickenhill Lane	Small pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157004	West of A452 and north of Middle Bickenhill Lane	Small, vegetated pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157005	West of A452 and north of Middle Bickenhill Lane	Small, vegetated pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157006	West of A452 and east of M42 near Middle Bickenhill Lane	Small/moderate sized, vegetated pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157007	West of A452 and east of M42 near Middle Bickenhill Lane	Small pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-157008	West of A452 and east of M42 near Middle Bickenhill Lane	Small, vegetated pond in Olympia motorcycle course	06 June 2013	24	Within land required
040-IA1-158001	Coleshill & Bannerly Pools SSSI, west of A446 Stonebridge Road	Coleshill Pool. Large pool, shaded by trees at margins	09 May 2013; 11 July 2013	24	90m, east
040-IA1-158002	Coleshill Pool Wood LWS	Small, spherical pond, shaded on margin of woodland	07 June 2013	24	Within land required
040-IA1-159001	Coleshill & Bannerly Pools SSSI, west of A446 Stonebridge Road	Pool north of Coleshill Pool. Large pool, heavily shaded by trees in marginal areas	09 May 2013; 11 July 2013	24	90m, east
040-IA1-159002	Brickfield Farm	Large ovoid pond in arable fields, surrounded by trees	07 June 2013	24	Within land required

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
040-IA1-159003	Brickfield Farm	Moderate sized pond near to footpath and arable fields	07 June 2013	24	Within land required
040-IA1-159004	Brickfield Farm	Large ovoid pond shaded by trees	07 June 2013	24	Within land required
040-IA1-165001	Park Hall SINC	'Orchard Pond', large pond with Azolla and Lemna cover, in grassland/ woodland	15 August 2012; 09 May 2013; 10 July 2013	25	Within land required
040-IA1-165002	Park Hall SINC	River Tame SLINC with moderate flow in river channel	15 August 2012; 08 May 2013	25	Within land required
040-IA1-165003	Land north of Park Hall SINC	Pond 4, large open pond in old sludge lagoon	21 November 2012	25	100m, north
040-IA1-165004	Park Hall SINC	'Hill Pond', large pond with high plant diversity, with *Azolla*	15 August 2012; 09 May 2013; 10 July 2013	25	Within land required
040-IA1-165005	Park Hall SINC	'Bridge Pond', large permanent pond within grassland area	15 August 2012	25	Within land required
040-IA1-165006	Land north of Park Hall SINC	Pond 3, large open pond in old sludge lagoon	10 October 2012	25	40m, north
040-IA1-165007	Park Hall SINC	'New Pond 1', small pond within grassland/ pasture	16 August 2012	25	Within land required
040-IA1-165008	Land north of Park Hall SINC	Pond 2, large open pond in old sludge lagoon	10 October 2012	25	50m, north
040-IA1-166001	Park Hall SINC	'Meanders Pool', large pond/lake	15 August 2012	25	Within land required
040-IA1-166002	Land north of Park Hall SINC	Pond 1, large open pond in old sludge lagoon	10 October 2012	25	40m, north
040-IA1-166003	Park Hall SINC	'Old Meanders Ditch', pond within marshland/ woodland	16 August 2012	25	Within land required
040-IA1-166004	Park Hall SINC	'New Pond 2', small pond with low vegetation cover, within grassland/pasture	16 August 2012; 07 May 2013; 10 July 2013	25	Within land required
040-IA1-166005	Park Hall SINC	'Ephemeral Pond under Pylon', shallow vegetated pond within grassland/pasture field	16 August 2012; 07 May 2013 (dry on 10 July 2013)	25	Within land required
040-IA1-166006	Plants Brook north of Park Hall SINC	Plants Brook, moderate flow tributary	11 June 2013	25	Within land required
040-IA1-166007	Park Hall SINC	'New Ditch 2', large and deep ditch, in grassland/pasture field	16 August 2012; 07 May 2013; 10 July 2013	25	Within land required

Ecology survey code	Location	Feature type	Survey date(s)	CFA	Distance from land required for the construction of the Proposed Scheme[11] (m)
040-IA1-166008	Park Hall SINC	'New Scrape 2', small pond with no/low vegetation within grassland/pasture	16 August 2012; 07 May 2013; 10 July 2013	25	Within land required
040-IA1-167001	Park Hall SINC	'New Ditch 1', small wet ditch in grassland/pasture field	16 August 2012	25	Within land required
040-IA1-167002	Park Hall SINC	'New Scrape 1', small pond with little vegetation within grassland /pasture	17 August 2012; 07 May 2013; 10 July 2013	25	Within land required
040-IA1-167003	Park Hall SINC	'Ephemeral Pool', shallow vegetated marshy pool grassland/pasture field	16 August 2012; 07 May 2013; 10 July 2013	25	Within land required
040-IA1-167004	Park Hall SINC	'Kidney Pond', small pond with low vegetation cover within grassland/pasture field	17 August 2012; 07 May 2013; 10 July 2013	25	Within land required
040-IA1-167005	Park Hall SINC	'M6 outfall Pond', receiving surface water from M6 runoff	16 August 2012	25	Within land required
040-IA1-167006	Dunlop Channel	Fort overflow drain, linear drainage channel with engineered banks	14 September 2012	25	Within land required
040-IA1-173001	Grand Union Canal SLINC	Grand Union Canal SLINC	14 September 2012	26	Within land required
040-IA1-174001	Digbeth Branch Canal SLINC	Digbeth Branch Canal SLINC	14 September 2012; 07 May 2013	26	Within land required

3.3 Deviations, constraints and limitations

3.3.1 A number of records of invertebrate species with aquatic larval phases and terrestrial adult phases were identified within the desk study data for the Castle Bromwich and Bromford area (CFA25) and the Washwood Heath to Curzon Street area (CFA26). These species of *Diptera*, including species belonging to the *Syrphidae* (hoverfly) and *Stratiomyidae* (soldier flies) are not normally identified at larval stage, as reliable species differentiation is not generally possible until they are in the adult stage. These records are therefore likely to be of adult specimens and should therefore only be considered in the terrestrial invertebrate report.

3.3.2 Outputs from RICT (River Invertebrate Classification Tool)[12] analysis undertaken online (Scottish Environment Protection Agency RICT website) and relevant biotic scores (Average Score Per Taxon (ASPT)[13], Biological Monitoring Working Party

[12] SEPA; RICT: http://rict.sepa.org.uk/; accessed 21 August 2013.
[13] Hawkes H.A. (1997). *Origin and Development of the Biological Monitoring Working Party Score System*. Water Research 32 (3): 964-968.

(BMWP)[13], Lotic-invertebrate Index for Flow Evaluation (LIFE)[14], Proportion of Sediment-sensitive Invertebrates (PSI)[15] and Community Conservation Index (CCI) scores)[10] are reported for invertebrate communities sampled in rivers only. Equivalent metrics for ponds, canals and ditches are provided in Volume 5: Appendix EC-004-001).

3.3.3 Access was available for most sites scoped for survey. The sites which could not be accessed are listed in Table 6.

Table 6: Summary of locations in CFA23, CFA24, CFA25 and CFA 26 inclusive where requirements for aquatic invertebrate survey identified but no access available for survey

Site and location	OS centroid grid reference	Description of proposed survey location	CFA	Distance from land required for the construction of the Proposed Scheme[16] (m)
Pond in Berkswell Marsh SSSI	SP 2281 7952	Pond, no further data available (site not visited), no survey was undertaken due to access constraints	23	10m, east
Ditch north-east of Marsh Farm	SP 2248 8021	Ditch, no further data available (site not visited), no survey was undertaken due to access constraints	23	Within land required
Bayleys Brook north of Marsh Farm	SP 2228 8013	Small watercourse (surveyed in other locations), no survey was undertaken due to access constraints	23	Within land required
River Tame SLINC at Wolseley Drive	SP 1148 8952	River Tame SLINC (surveyed in further downstream locations),heavily modified watercourse (viewed from above at road level as not possible to safely enter watercourse at this location)	26	Within land required
River Rea SLINC between Saltley Road and Erskine Street	SP 0922 8831 - SP 0860 8731	River Rea SLINC canalised watercourse (viewed from above at road level as not possible to safely enter watercourse at this location)	26	Within land required

3.3.4 Two sites were not subject to the required number of surveys due to land access constraints:

- the water body north of Coleshill Pool (040-IA1-158001) in the Birmingham Interchange and Chelmsley Wood (CFA24) area , only two surveys; spring and summer 2013, instead of the three that are normally required for national pond surveys (spring, summer, autumn) as there was no access during 2012 to undertake an autumn survey; and.
- Plants Brook (040-IA1-166006) in the Castle Bromwich and Bromford area (CFA 25), only one survey; spring 2013, instead of the two that are normally required for RIVPACS and other standard surveys of rivers (spring and autumn)

[14] Extence, C.A., Balbi, D.M. and Chadd, R. P. (1999). *River Flow Indexing Using British Benthic Macro-invertebrates: A Framework for Setting Hydroecological Objectives*. Regulated Rivers: Research and Management. 15: 543-574.
[15] Extence, C.A., Chadd, R. P., England, J., Dunbar, M. J. , Wood, P. J. and Taylor, E. D. (2013). *The Assessment of Fine Sediment Accumulation in Rivers Macro-invertebrate Community Response*. River Research and Applications. 29: 17–55.
[16] The phrase 'Within land required' represents an abbreviation of this term

as there was no access during 2012 to undertake an autumn survey.

3.4 Baseline

Balsall Common and Hampton-in-Arden (CFA23)

Beechwood Farm and Farmhouse

3.4.1 A national pond survey at 040-IA1-148004 recorded a high invertebrate diversity[17], (52 invertebrates over three surveys). The most abundant taxa were common and widespread invertebrates, including snails (*Radix balthica, Lymnaea stagnalis, Physa sp., Potamopyrgus antipodarum*), shrimps (*Crangonyx pseudogracilis*) and midge larvae (*Chironomidae*). In addition, the pond supported mayfly (*Cloeon dipterum, Caenis robusta* (Conservation Score 5, 'local'), water louse (*Asellus aquaticus*), damselflies (*Coenagrion spp.*), emperor dragonfly (*Anax imperator*), black-tailed skimmer (*Orthetrum cancellatum*, Conservation Score 5), 12 species of Hemiptera, including *Ranatra linearis, Sigara limitata, Corixa dentipes* and *Corixa panzeri* (Conservation Score 5), 11 species of water beetle including notable species *Helochares lividus, Ilybius fenestratus, Hydroglyphus geminus* (Conservation Score 7 'notable') and five species of caddis (*Limnephilus vittatus, Limnephilus lunatus, Athripsodes aterrimus, Mystacides longicornis, Agapetus fuscipes*).

3.4.2 A ditch survey at 040-IA1-148003 recorded a moderate to low invertebrate diversity[18] (13 taxa), with the community dominated by common species including water louse (*A.aquaticus*), freshwater shrimp (*Gammarus pulex*), leeches (*Glossiphonia complanata*), Oligochaeta and non-biting midge (*Chironomidae*). No notable species were present, with the exception of *Agabus paludosus* ('local' according to Buglife, 2010[19]).

3.4.3 A rapid pond assessment survey at 040-IA1-148002 showed the pond to have a low invertebrate diversity[20] (eight families); including damselfly, beetle larvae, Baetidae mayfly, *Acroloxus sp*. snails, *Chironomidae, Dixidae* (non-biting midge) and Oligochaeta worms. Species level identification was not undertaken for the purpose of the assessment of this water body.

Land north of Labernum Farm and Waste Lane

3.4.4 A ditch survey at 040-IA1-148001 recorded a moderate diversity of invertebrates (15 taxa). The community was dominated by common species including water louse (*A.aquaticus*), freshwater shrimp (*G.pulex*), leeches (*G.complanata*), Oligochaeta and non-biting midge (*Chironomidae*). No notable species were present.

Land south of Moat Farm and west of Beechwood Farm

3.4.5 A rapid pond assessment survey at 040-IA1-148005 showed the pond to have a moderate invertebrate diversity (10 families), including Limnephilidae (caddis) *Agabus*

[17]Macro-invertebrate diversity calculations using the National Pond Survey was based upon Department for Environment, Food and Rural Affairs; Ponds, Pools and Lochans; http://adlib.everysite.co.uk/adlib/defra/content.aspx?doc=11588&id=11606; accessed: 24 June 2013.
[18] Macro-invertebrate diversity for ditch survey is calculated using several attributes. See Palmer, M., Drake, M. and Stewart, N. (2013).
[19] Palmer, M., Drake,M. and Stewart, N. (2013). *A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of grazing marsh ditch systems*. Version 6. Buglife.
[20] Invertebrate diversity using the rapid pond assessment is based upon macro-invertebrate identification, and how the invertebrate is related to environment stressors. See http://www.pondconservation.org.uk/Surveys/npspsymmethods/rapidassessment.

sp. (diving beetle), amphipod shrimps, pea mussels, Chironomidae, Dixidae (non-biting midge) and Oligochaeta worms. Species level identification was not undertaken or required for the assessment of this water body.

Bayleys Brook

3.4.6 The survey of Bayleys Brook at 040-IA1-149001 recorded a moderate to high diversity of invertebrates (25 taxa over two samples). The PSI score in 2012 indicated that the condition was sedimented (33.3) and in 2013 the condition was heavily sedimented (9.5), which was supported by the site observations and was likely to affect the ecology of the stream. The community was dominated by common species (generally tolerant to organic pollution) including water louse (*A.aquaticus*), freshwater shrimp (*G.pulex*), whirlpool rams horn snail (*Anisus vortex*), Oligochaeta and non-biting midge (Chironomidae), with no notable species present. The CCI score suggested that the invertebrate community was of moderate conservation value.

3.4.7 LIFE[21] scores were relatively low (6.80 in 2012 and 5.80 in 2013), and indicated that the invertebrate community was dominated by animals that were associated with slow flowing waters.

3.4.8 BMWP[22] and ASPT[23] (58 in 2012 and 42 in 2013) scores indicated that Bayleys Brook was of poor to moderate biological quality, while RICT[24] analysis indicated that Bayleys Brook was of poor overall quality. This suggests that the community was impacted by poor water and/or habitat quality.

3.4.9 No Environment Agency or other desk study data were available for Bayleys Brook.

3.4.10 A rapid pond assessment survey at 040-IA1-149002 indicated that the invertebrate species diversity was low (nine taxa). All taxa were common, widespread and most were relatively tolerant to organic pollution, including shrimps (*C.pseudogracilis*), snails (*R.balthica*), water louse (*A.aquaticus*), and non-biting midge (Dixidae, Chironomidae).

Land south of Berkswell Station

3.4.11 A Predictive System for Multimetrics (PSYM) survey of the pond at 040-IA1-148007 recorded a moderate invertebrate diversity (26 taxa over two samples), the most abundant of which were common and widespread, including mosquito larvae (*Culex territans*) and non-biting midges (Chironomidae). The pond also supported six species of Heteroptera (true bugs), including the locally notable *S.limitata* and *Notonecta marmorea viridis* (Conservation Score 5). It also supported at least four species of beetle, including the notable diving beetle (*Rhantus suturalis*, Conservation Score 7).

[21] Lotic-invertebrate Index for Flow Evaluation (LIFE) is a method for linking benthic macro-invertebrate data to prevailing flow regimes. Higher flows result in higher LIFE scores.
[22] The Biological Monitoring Working Party Score (BMWP) system is a method of assessing water quality using families of insects and other aquatic invertebrates present
[23] The Average Score per Taxon (ASPT) score is the BMWP score divided by the number of scoring taxa in a sample. This can be calculated for any of the versions of BMWP score.
[24] The River Invertebrate Classification Tool (RICT) is a computer programme which uses site specific measurements of the river environment (e.g. width, depth, altitude) to predict which macro-invertebrates you would expect to find at a site in the absence of pollution.

3.4.12 A ditch survey at 040-IA1-148006 recorded a moderate to high invertebrate diversity (29 taxa and 19 species over the two years of sampling). The most abundant taxa were common and widespread invertebrates, including snails (*R.balthica, Stagnicola palustris, Succinea putris* and the locally notable *Aplexa hypnorum* and *Anisus leucostoma* - Conservation Score 5), pea mussels, water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*), midge (Chironomidae) and mosquito larvae (Culicidae). The water body also supported seven species of beetle, including notable diving beetles (*R.suturalis* and *H.lividus*, Conservation Score 7). Five species of caddisfly larvae (including the locally notable *Limnephilus bipunctatus* – Conservation Score 5) and one species of damselfly (*Coenagrion puella*) were also recorded.

Moat House Farm

3.4.13 A ditch survey at 040-IA1-149006 indicated that the invertebrate species diversity was low (11 taxa). All taxa were common and widespread. The most abundant taxa were shrimp (*G.pulex*), snails (*P.antipodarum*), water louse (*A.aquaticus*), pea mussels (*Sphaerium sp. / Pisidium sp.*), Oligochaeta worms and non-biting midge (Chironomidae).

3.4.14 A PSYM survey of the pond at 040-IA1-149007 recorded a moderate diversity of invertebrates (eleven families), including Hydrophilidae, Dytiscidae (water beetles), Corixidae and Notonectidae (water boatman). Species level identification was not undertaken or required for the assessment of this water body.

3.4.15 A rapid assessment (pond survey) at 040-IA1-149008 indicated a moderate to high macro-invertebrate diversity (18 families), suggesting that the pond was of good quality (rapid assessment score of 48). Species level identification was not undertaken or required for the assessment of this water body.

Land on north side of Truggist Lane

3.4.16 A PSYM survey of a pond at 040-IA1-149003 recorded a moderate invertebrate diversity (13 taxa). The most abundant taxa were common and widespread invertebrates including water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*) and midge larvae (Chironomidae). The pond also supported two species of beetle and two species of Heteroptera (true bugs).

3.4.17 A rapid pond assessment survey at 040-IA1-149004 indicated that the invertebrate taxa diversity was moderate (nine families), and included Dytiscidae (diving beetles). Species level identification was not undertaken or required for the assessment of this water body.

Land east of Lavender Hall Farm

3.4.18 A PSYM survey of the pond at 040-IA1-149005 recorded a moderate invertebrate diversity (16 taxa). The most abundant taxa were common and widespread invertebrates, including great ram's horn (*Planorbarius corneus*), white ram's horn (*Gyraulus albus*) and whirlpool ram's horn (*A.vortex*) snail, Oligochaeta worms, lesser water boatman (*Sigara spp.*) and midge larvae (Chironomidae). The pond also supported three species of Heteroptera (true bugs). The ram's horn snail *A.leucostoma*, (Conservation Score 5) was recorded in this pond.

3.4.19 A rapid pond assessment survey at 040-IA1-149002 indicated that the invertebrate species diversity was moderate (nine taxa). All taxa were common, widespread and most were relatively tolerant to organic pollution, including shrimps (*C.pseudogracilis*), snails (*R.balthica*), water louse (*A.aquaticus*), and non-biting midge (Dixidae, Chironomidae).

North-west of Lavender Hall Lane

3.4.20 A rapid pond assessment survey at 040-IA1-150001 indicated that the pond had a moderate invertebrate diversity (ten families), including (Gyrinidae, Hydrophilidae, Dytiscidae, Veliidae, Baetidae, *Crangonyx* sp., A*sellus* sp., Oligocheata, Culicidae, Cladocera) based on the rapid assessment method. Species level identification was not undertaken or required for the assessment of this water body.

Land on north-west side of Lavender Hall Lane

3.4.21 A PSYM survey of the pond at 040-IA1-150002 indicated that this water body had a very low invertebrate diversity. Only one taxa was recorded as being present: *Chaoborus sp.* (ghost midge), which was of no significant nature conservation importance.

3.4.22 A PSYM survey of the pond at 040-IA1-150003 recorded that the pond supported moderate invertebrate species diversity (13 taxa). Most taxa were common and widespread. The most abundant groups were shrimps (*C.pseudogracilis*), lesser water boatman (*Hesperocorixa sahlbergi*), diving beetles (Dytiscidae), Oligochaeta worms and non-biting midge (Chironomidae). One species of diving beetle (*Hygrotus impressopunctatus*) was of some nature conservation interest (Conservation Score 5).

Land at the junction between Park Lane and A452

3.4.23 A rapid pond assessment survey at 040-IA1-150004 recorded a low invertebrate diversity (four taxa only – Planorbiidae, *C.pseudogracilis* and *Asellus sp.*) based on rapid assessment. Species level identification was not undertaken or required for the assessment of this water body.

Land at the roundabout north of Bradnocks Marsh Lane

3.4.24 A PSYM survey of the pond at 040-IA1-152001 found this water body supported a moderate to high diversity of invertebrates (28 taxa). Most taxa were common and widespread. The most abundant groups were snails (*P.antipodarum*, Planorbiidae), mayfly larvae (Baetidae), bugs (Notonectidae, Corixidae), beetles (Dystiscidae) and caddisfly (Limnephilidae). One species of diving beetle (*Hygrotus confluens* - Conservation Score 7) and one species of bug (*N.marmorea-viridis* – Conservation Score 5) are of some nature conservation interest.

Marsh Lane Nature Reserve

3.4.25 A National Pond Survey at 040-IA1-153004 recorded a very high invertebrate diversity (63 taxa in total over three surveys). The most abundant taxa were common and widespread invertebrates, including snails (*R.balthica, S.putris, Planorbis sp*. and *Gyraulus laevis*, Conservation Score 6, 'regionally notable'), pea mussels (Sphaeridae), Oligochaeta worms, water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*), mayfly (*Cloeon simile, C.robusta*, Conservation Score 5), and midge larvae (Chironomidae,

Chaoboridae). The pond also supported 15 species of Hemiptera, including the greater waterboatman (*N.marmorea viridis*, Conservation Score 5) and the lesser waterboatman *Sigara scotti* (Conservation Score 5) and *Micronecta scholtzi* (Conservation Score 6) and the water stick insect *R.linearis* (Conservation Score 5) , eight species of water beetle including four species of interest (*I.fenestratus* and *Enochrus melanocephalus* -Conservation Score 7, *Acilius sulcatus* and *H.impressopunctatus* - Conservation Score 5) and five species of caddis (including *Agrypnia obsoleta, Leptocerus tineiformis*, Conservation Score 5). In addition, several species of Odonata (dragonflies and damselflies were recorded, the blue-tailed damselfly (*Ischnura elegans*), azure damselfly (*C.puella*), the red eyed damselfly (*Erythromma najas*), the emperor dragonfly (*A.imperator*) and the black-tailed skimmer (*O.cancellatum*) (both of Conservation score 5).

3.4.26 A National Pond Survey at 040-IA1-153002 recorded a high invertebrate diversity, (39 taxa in a single survey). The most abundant taxa were common and widespread invertebrates, including snails (*L.stagnalis, Acroloxus lacustris, G.albus, Gyraulus crista, Hippeutis complanatus, P.corneus*), pea mussels (Sphaeridae), water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*) mayfly (*Cloen dipterum, C.simile*), and midge larvae (Chironomidae, Chaoboridae). In addition, the pond supported 10 species of Hemiptera (true bugs). Four species of damselfly larvae were present: the blue-tailed damselfly (*I.elegans*); common blue damselfly (*Enallagma cyathigerum*); the azure damselfly (*C.puella*); and the red-eyed damselfly (*E.najas*), the emperor dragonfly (*A.imperator*, Conservation Score 5), and four species of water beetles. Two species of caddisfly larvae were also present, including *Phrygaena grandis* (Conservation Score 5).

River Blythe SSSI

3.4.27 The River Blythe SSSI citation, reports that the river supported pea mussel (*Pisidium moitessierianum*). It is not known whether this species is present within the section of the Blythe SSSI which falls within the land required for the construction of the Proposed Scheme. The River Blythe SSSI was sampled for invertebrates at two different locations within this site.

3.4.28 The Environment Agency also collected data from the River Blythe SSSI. The nearest sites were from Patrick Bridge (within the land required for the construction of the Proposed Scheme) and Packington Ford footbridge (SP 21800 85200, approximately 5km downstream from the land required for the construction of the Proposed Scheme).

3.4.29 At the Patrick Bridge site, the Environment Agency data (2006-2009) demonstrated a relatively high diversity of invertebrates, the presence of pollution sensitive taxa (Ephemeridae, Goeridae, Lepidostomatidae, Leptoceridae) and BMWP and ASPT scores that are generally indicative of moderate to good biological quality.

3.4.30 At the Packington Ford footbridge site, the Environment Agency data (2003-2007) were characterised by a high diversity of invertebrates, the presence of pollution sensitive taxa (Ephemeridae, Goeridae, Leptoceridae) and BMWP and ASPT scores are generally indicative of good biological quality.

3.4.31 No notable species were recorded at either of the Environment Agency sites on the River Blythe SSSI (although most of the data were only to family level).

3.4.32 The River Blythe SSSI was surveyed as part of the baseline surveys in a slow flowing glide and pool habitat at 040-IA1-154004. The water body was characterised by a high invertebrate diversity (35 taxa over two surveys), the most abundant taxa included snails (*S.putris, Physa sp*.), pea mussels, shrimps (*G.pulex*), water louse (*A.aquaticus*), alderfly (*Sialis lutaria*) and non-biting midge (Chironomidae). Only one species of local interest, the snail *A.leucostoma* (Conservation Score 5). The CCI score (10.0) suggests that the invertebrate community is of moderate conservation value.

3.4.33 The relatively pollution sensitive taxa recorded (including *Rhyacophila dorsalis, Athripsodes cinereu, Hydropsyche pellucida, Plectrocnemia conspersa, Lype reducta*), and the ASPT (moderate) and BMWP (42 in 2012 and 132 in 2013) and RICT analysis demonstrated that River Blythe SSSI at this location was of moderate overall quality, using the biological and environmental data collected, suggesting that the community was moderately impacted by water and/or habitat quality issues. There were however differences in invertebrate diversity and derived biotic scores between the two different sampling dates. Diversity and biotic scores were higher in spring 2013 (31 taxa) compared with autumn 2012 (14 taxa), although the reasons for these differences were not clear.

3.4.34 The River Blythe SSSI was also surveyed at 040-IA1-153010, where it was a fast flowing, shallow and stony riffle. The samples at this location recorded a high diversity of invertebrates (32 taxa over two years surveys), the most abundant of which included snails (*P.antipodarum, Ancylus fluviatilis*), pea mussels, shrimps (*G.pulex*), water louse (*A.aquaticus*), mayflies (*Baetis sp*.), caddis (*Hydropsyche pellucidula*), Oligochaeta worms and non-biting midge (Chironomidae). No species identified were of significant nature conservation interest. The CCI score (7.60) suggests that the Blythe SSSI at this site was of low conservation value.

3.4.35 The presence of moderate numbers of pollution sensitive taxa (e.g. Leptoceridae, *A.cinereus*, Goeridae, other caddis), and the BMWP (93 in 2012 and 82 in 2013), ASPT (4.9 in 2012 and 4.8 in 2013) and RICT analysis demonstrated that River Blythe SSSI at this location was of moderate overall quality, using the biological and environmental data collected, suggesting the community was moderately impacted by water and/or habitat quality issues.

3.4.36 The PSI scores (between 23.8-60.0) on the River Blythe SSSI indicated that the river was slightly sedimented to moderately sedimented.

3.4.37 The LIFE scores (between 6.27-7.26) from Environment Agency data and our survey data were moderate to high, indicating that the invertebrate community was characterised by a range of animals that were associated with slow flowing to fast flowing waters.

River Blythe Bypass

3.4.38 The River Blythe Bypass watercourse is a re-aligned ditch that connects at two locations to the River Blythe SSSI. It was surveyed at several locations in autumn 2012 and spring 2013. No Environment Agency or other desk study data were available.

3.4.39 An invertebrate survey at 040-IA1-153005 indicated that the invertebrate species diversity was relatively low (nine taxa), and all taxa were common and widespread. The most abundant taxa were shrimps (*G.pulex*), water louse (*A.aquaticus*), pea mussels and non-biting midge (Chironomidae).

3.4.40 An invertebrate survey at 040-IA1-153007 recorded moderate invertebrate species diversity (16 taxa) including the notable diving beetle *R.suturalis* (Conservation Score 7). The most abundant taxa were snails (*S.putris*, and the locally notable *A.leucostoma* and *A.hypnorum* – Conservation Score 5), pea mussels, water louse (*A.aquaticus*), shrimp (*C.pseudogracilis*), a species of water scavenger beetle (*Anacaena globulus*) and mosquito larvae (Culicidae).

3.4.41 A ditch survey was carried out on the ditch continuing west of 040-IA1-153007 (Volume 5: Map EC-12-104-F5) recorded moderate invertebrate species diversity (18 taxa), all common and widespread. The most abundant taxa were pea mussels, water louse (*A.aquaticus*), shrimp (*C.pseudogracilis*) and Chironomidae. The ditch supported four species of Hemiptera (true bugs) and two species of water beetle. No notable species were recorded.

3.4.42 An invertebrate survey at 040-IA1-153008 recorded a moderate species diversity of invertebrates, with 16 taxa noted in low abundances (less than 10 individuals sampled), with the exception of *P.antipodarum* (snail) and Chironomidae. No species were identified as significant conservation interest.

3.4.43 The CCI scores recorded on the River Blythe Bypass at 040-IA1-153005 (1) and 040-IA1-153007 (1) suggested that the invertebrate community was of low conservation value, with the exception of the site at 040-IA1-153007, which was indicative of very high conservation value. However, the very high CCI score (20.3) recorded at 040-IA1-153007 was not considered to represent the site. Only one notable species (Conservation Score 7 or greater) was recorded: the diving beetle *R.suturalis*, which is relatively common in the area. As only a few taxa were recorded at this site, the Conservation Score of the diving beetle inflated the overall CCI score and therefore, the stream should only be considered moderate conservation value.

3.4.44 The PSI scores (ranging between 4.0 - 36.4) indicated that the River Blythe Bypass was sedimented to heavily sedimented, which concurs with the site observations and likely to affect the ecology of the stream.

3.4.45 The LIFE scores (6.40 - 7.44) were low to moderate, indicating that the invertebrate community was characterised by a range of animals that were associated with slow flowing to moderately fast flowing waters.

3.4.46 The invertebrate sample at 040-IA1-153005 was characterised by the lowest LIFE and PSI score within the sites surveyed on the River Blythe Bypass, suggesting that this

site suffers from the lowest flow and highest sedimentation of all three sites within the River Blythe Bypass.

3.4.47 The limited number of pollution sensitive taxa (mayfly, caddis), as well as BMWP (25-58) and ASPT (3.1-4.5) analysis has suggested that the River Blythe Bypass was of low to moderate overall biological quality. This suggests that the invertebrate community was impacted by significant water and/or habitat quality issues.

Horn Brook

3.4.48 Horn Brook is a tributary of the River Blythe Bypass and was surveyed at two locations, no Environment Agency or other desk study data was available.

3.4.49 An invertebrate survey at 040-IA1-153003 recorded a low diversity of invertebrates, (five families in low abundances) including common and widespread snails (*P.antipodarum*), bugs (*Velia caprai*), pea mussels, caddisfly larvae (Limnephilidae) and Diptera larvae (Pediciidae). No species were identified as being of significant conservation interest. Only two species level identifications were recorded, therefore the CCI score was not calculated. The low diversity of invertebrates suggested that the invertebrate community was of low conservation value.

3.4.50 Due to only two species level identifications, the PSI and LIFE scores were not calculated.

3.4.51 The BMWP (18) score and ASPT (4.5) indicated that Horn Brook was of low overall biological quality, suggesting that the community was impacted by significant water and/or habitat quality issues.

3.4.52 An invertebrate survey at 040-IA1-153001 indicated a moderate to low diversity of invertebrates (nine families recorded in low to moderate abundances). These included the common and widespread snails (*Galba truncatula, P.antipodarum*), pea mussels, bugs (Gerridae), caddisfly larvae (*Limnephilidae, Rhyacophilidae*), damselfly larvae (Coenagrioniidae) and mayfly larvae (*Ephemera danica*). No species were identified to be of significant nature conservation interest.

3.4.53 The PSI scores (36.4) indicated that the tributary was sedimented, which is likely to affect the ecology of the stream.

3.4.54 The LIFE scores (7.55) were moderate, indicating that the invertebrate community was characterised by a range of animals that were associated with slow flowing to moderately fast flowing waters.

3.4.55 The number of pollution sensitive taxa (mayfly and caddis), as well as BMWP score (58) ASPT analysis (4.5) demonstrated that Horn Brook was of moderate to good overall quality for this type and size of water body.

Shadow Brook

3.4.56 Shadow Brook was surveyed as part of the baseline surveys in autumn 2012 and spring 2013, but no Environment Agency or other desk study data were available.

3.4.57 An invertebrate survey of Shadow Brook at 040-IA1-155001 recorded a high invertebrate diversity (32 taxa over two years). The most abundant species were snails

(*P.antipodarum, R.balthica*), pea mussels, shrimps (*G.pulex*), water louse (*A.aquaticus*), mayflies (*Baetis rhodani*), caddis (*H.pellucidula*, Limnephilidae) and non-biting midge (Chironomidae). Most of the species identified are common and widespread, with the exception of the locally notable leech *Erpobdella testacea* and caddisfly larvae *Stenophylax vibex*. The CCI score (10.1, 1.2) suggested that the invertebrate community was of moderate conservation value.

3.4.58 The PSI scores (41.2, 25.8) indicate that Shadow Brook was sedimented, which concurs with the site observations and was likely to affect the ecology of the stream.

3.4.59 The LIFE scores (7.21, 6.64) were moderate, indicating that the invertebrate community was characterised by a range of animals that are associated with slow flowing to moderately fast flowing waters.

3.4.60 The limited number of pollution sensitive taxa (mayfly, caddis), as well as BMWP (60, 92), ASPT (3.8, 4.6) and RICT analysis demonstrated that Shadow Brook was of moderate overall quality, using the biological and environmental data collected, suggesting that the community was moderately impacted by significant water and/or habitat quality issues.

Land west of A452 and north of Meriden Road

3.4.61 A rapid pond assessment of the pond at 040-IA1-153006 indicated low to moderate macro-invertebrate diversity (5 taxa), suggesting that the pond was of low quality. Species level identification was not undertaken or required for the assessment of this water body.

3.4.62 A PSYM survey of the pond at 040-IA1-154006 indicated the invertebrate diversity was low (nine taxa). At least five species of water beetles were recorded including the locally notable *Hygrotus versicolor* (Conservation Score 5) and the snail *A.leucostoma* (Conservation Score 5).

3.4.63 A PSYM survey of a pond at 040-IA1-154005 indicated that the invertebrate diversity was moderate (18 families). The most abundant taxa were shrimps (*C.pseudogracilis*), Oligochaeta worms and Diptera larvae (non-biting midge (Chironomidae) and Tipulidae). Damselfly (Coenagrionidae), dragonfly (Libellulidae), bugs (Corixidae), caddisfly larvae (Limnephilidae) and beetles (Dytiscidae, Helophoridae).

3.4.64 A PSYM survey of a pond at 040-IA1-154007 indicated that the invertebrate diversity was low (12 families). The most abundant taxa were Oligochaeta worms and non-biting midge (Chironomidae). Damselfly (*Ischnura sp.*), dragonfly (Libellulidae), bugs (Corixidae), caddisfly larvae (Limnephilidae) and beetles (Dytiscidae, Noteridae).

3.4.65 A PSYM survey of a pond at 040-IA1-154008 recorded a high diversity of invertebrate species (31 taxa). Most of the taxa were common and widespread. The most abundant taxa were shrimps (*C.pseudogracilis*), mayfly larvae (*C.dipterum*), damselfly larvae (Coenagrionidae) and non-biting midge (Chironomidae). The pond also supported eight species of water beetles, including *R.suturalis* (Conservation Score 7) and *H.versicolor* (Conservation Score 5).

3.4.66 A rapid pond assessment survey at 040-IA1-154003 recorded a high invertebrate diversity (13 families) including caddis, dragonfly, damselfly, Dytiscidae, *Helophorus sp.* Heterpoptera, Baetidae, Amphipoda, *Asellus sp*. Oligochaeta, Chironomidae based on rapid assessment. Species level identification was not undertaken or required for the assessment of this water body.

3.4.67 A ditch survey at 040-IA1-154001 recorded very low invertebrate species diversity, (seven taxa) comprising snails (S.*palustris, Zonitoides nitidus*), water louse (*A.aquaticus*) and various Diptera (Psychodidae, Culicidae and Chironomidae), all of which were common and widespread.

3.4.68 A rapid pond assessment survey at 040-IA1-154002 indicated a moderate taxa diversity (nine families), including Hydrophilidae and Dytiscidae – water beetles. Species level identification was not undertaken or required for the assessment of this water body.

Pasture Farm

3.4.69 A rapid pond assessment survey at 040-IA1-155002 indicated that the pond had a low invertebrate diversity(six taxa), including beetle larvae (*Hydroporus sp*.), water flea (Cladocera), Chironomidae, (non-biting midge) mosquito larvae (Culicidae) and Oligochaeta worms. Species level identification was not undertaken or required for the assessment of this water body.

3.4.70 Table 7 provides a summary of notable invertebrate species recorded within the Balsall Common and Hampton-in-Arden area (CFA23).

Table 7: Summary of notable invertebrate species recorded within the Balsall Common and Hampton-in-Arden (CFA23) area

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Caddis	*A.obsoleta*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	5 'local'
Emperor dragonfly (larvae)	*A.imperator*	040-IA1-148004	Beechwood Farm	SP 25319 77129	2	0	5 'local'
Button Ramshorn Snail	*A.leucostoma*	040-IA1-148004	Beechwood Farm	SP 25319 77129	1	1	5 'local'
Mayfly	*C.robusta*	040-IA1-148004	Beechwood Farm	SP 25319 77129	2	2	5 'local'
Mayfly	*C.robusta*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	66	66	5 'local'
Lesser waterboatman	*C.dentipes*	040-IA1-148004	Beechwood Farm	SP 25319 77129	3	3	5 'local'

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Lesser waterboatman	*C.panzeri*	040-IA1-148004	Beechwood Farm	SP 25319 77129	3	3	5 'local'
Water scavenger beetle	*E.melanocephalus*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	7 *'notable'*
Smooth Ramshorn snail	*G.laevis*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	8	8	6 'regionally notable'
Water scavenger beetle	*H.lividu*	040-IA1-148004	Beechwood Farm	SP 25319 77129	4	3	7 *'notable'*
Water scavenger beetle	*H.lividu*	040-IA1-148006	Land south of Berkswell Station	SP 24828 77361	1	1	7 *'notable'*
Diving beetle	*H.geminus*	040-IA1-148004	Beechwood Farm	SP 25319 77129	2	2	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-152001	Land at roundabout north of Bradnocks Marsh Lane	SP 2228 7957	4	4	7 *'notable'*
Diving beetle	*H.impressopunctatus*	040-IA1-150003	Land on the north-west side of Lavender Hall Lane	SP 2369 7824	2	2	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	5 'local'
Diving beetle	*I.fenestratus*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	7 *'notable'*
Diving beetle	*I.fenestratus*	040-IA1-148004	Beechwood Farm	SP 2532 7713	1	1	7 *'notable'*
Caddis	*L.tineiformis*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	11	11	5 'local'
Lesser water boatman	*M.scholtzi*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	6 'regionally notable'
Greater water boatman	*N.marmorea viridis*	040-IA1-152001	Land at roundabout north of Bradnocks	SP 2228 7957	1	1	5 'local'

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
			Marsh Lane				
Greater water boatman	*N.marmorea viridis*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1	5 'local'
Black-tailed skimmer (dragonfly)	*O.cancellatum*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	1	1 (larva)	5 'local'
Water stick insect	*R.linearis*	040-IA1-148004	Beechwood Farm	SP 25319 77129	1	1	5 'local'
Water stick insect	*R.linearis*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	3	3	5 'local'
Diving beetle	*R.suturalis*	040-IA1-148004	Beechwood Farm	SP 25319 77129	3	2	7 *'notable'*
Diving beetle	*R.suturalis*	040-IA1-148006	Land south of Berkswell Station	SP 24828 77361	3	3	7 *'notable'*
Diving beetle	*R.suturalis*	040-IA1-148007	Land south of Berkswell Station	SP 24843 77359	3	3	7 *'notable'*
Diving beetle	*R.suturalis*	040-IA1-153007	Land west of A452 and north of Meriden Road	SP 21811 81358	1	1	7 *'notable'*
Diving beetle	*R.suturalis*	040-IA1-154008	Land west of A452 and north of Meriden Road	SP 2142 8174	1	1	7 *'notable'*
Lesser water boatman	*S.limitata*	040-IA1-148004	Beechwood Farm	SP 25319 77129	1	1	5 'local'
Lesser water boatman	*S.scotti*	040-IA1-153004	Marsh Lane Nature Reserve	SP 21765 80809	8	8	5 'local'

Notable species

3.4.71 The ditch and pond on the land south of Berkswell Station (040-IA1-148006), the River Blythe Bypass watercourse within the land west of A452 and north of Meriden Road (040-IA1-153007) and the pond at Beechwood Farm (040-IA1-148004) were of note for their invertebrate communities, with species of diving beetle which are of relatively high conservation importance (*R.suturalis*, *H.geminus* and *H.lividus*) recorded. These

species are classified as notable (Conservation Score: 7) in the index developed by Chadd and Extence (2004). Also in the Berkswell area, a pond that appears to act as a balancing pond near to the roundabout (040-IA1-152001) supported a relatively diverse community of invertebrates, including the diving beetle *H.confluens* (Conservation Score: 7). No species discussed are Nationally Scarce, red data book or higher within ICUN criteria, but are nonetheless noteworthy.

3.4.72 The ponds in Marsh Lane Nature Reserve (040-IA1-153004 and 040-IA1-153002) were characterised by a high diversity of aquatic invertebrates. At pond 040-IA1-153004 two species classified as notable were recorded. These were both beetle species (*I.fenestratus* and *E.melanocephalus*). However, in a recent review of the conservation status of aquatic beetles for the JNCC[25], neither species are now considered as being Nationally Scarce and are described as 'species that are too widespread to qualify as Nationally Scarce, formerly classified as Nationally Notable List B'.

3.4.73 From the aquatic sampling 040-IA1-153004 appears to support several species of dragonfly including the emperor dragonfly (*A.imperator*) and the black-tailed skimmer (*O.cancellatum*) which breed in the pond, as well as four species of damselfly: the blue-tailed damselfly (*I.elegans*), common blue damselfly (*E.cyathigerum*), azure damselfly (*C.puella*) and the red-eyed damselfly (*E.najas*). However, previous site surveys recorded the following adult Odonata species: common darter (*Sympetrum striolatum*), brown hawker (*Aeshna grandis*), emerald damselfly (*Lestes sponsa*) and blue-tailed damselfly. In addition, the nature reserve had records of adult red-veined darter (*Sympetrum fonscolombii*), although it is not clear if they are breeding at this location. The red-veined darter is classified as notable (Conservation Score: 7). However, in a recent review of Red Data species of Odonata for the JNCC[26]; the conservation status has been downgraded to being a species of least concern, based on International Union for Conservation of Nature and Natural Resources Red List of Threatened Species (IUCN) criteria.

3.4.74 The River Blythe SSSI is notable for its relatively high invertebrate diversity (and moderate overall quality according to the RICT analysis) in some areas, although none of the species recorded are of high nature conservation interest. Shadow Brook was characterised by lower invertebrate diversity, and the community is classified as being moderate by the RICT analysis.

Birmingham Interchange and Chelmsley Wood (CFA24)

Hollywell Brook

3.4.75 Hollywell Brook was surveyed at one location as part of the baseline surveys in autumn 2012 and spring 2013, but no Environment Agency or other desk study data were available.

3.4.76 An invertebrate survey of Hollywell Brook at 040-IA1-156001 noted moderate invertebrate diversity, (12 taxa). The most abundant species were snails (*P.antipodarum*), pea mussels, shrimps (*G.pulex*), water louse (*A.aquaticus*), mayflies

[25] Foster, G.N. (2010) *A review of the scarce and threatened Coleoptera of Great Britain Part 3 - Water beetles of Great Britain. Species Status 1*. Joint Nature Conservation Committee, Peterborough.
[26] Daguet, C. French and G. Taylor, P. (2008) *The Odonata Red Data List for Great Britain*. JNCC, Peterborough.

(*Baetis sp.*), caddis (*Hydropsyche angustipennis*), blackfly larvae (*Simulium sp.*) and non-biting midge (Chironomidae). All of the species identified were common and widespread and the CCI score (7.6, 7.4) indicated that the invertebrate community was of low conservation value.

3.4.77 The PSI scores (31.2, 42.9) indicated that the watercourse condition was moderately sedimented to sedimented, which was likely to have some effect the ecology of the stream.

3.4.78 The moderate number of pollution sensitive taxa recorded (*E danica, Athrisopodes cinereus, Hydropsyche augustipennis*) and ASPT (3.8, 5.2) and BMWP scores (42, 89) and RICT analysis demonstrated that Hollywell Brook was of moderate overall quality, using the biological and environmental data collected. This suggests that the community was moderately impacted by significant water and/or habitat quality issues.

3.4.79 The LIFE scores (7.57, 7.40) were moderate, indicating that the invertebrate community was characterised by a range of animals that are associated with slow flowing to moderately fast flowing waters.

Land near Packington Lane and Middle Bickenhill Lane

3.4.80 A ditch survey at 040-IA1-156002 recorded a moderate invertebrate diversity (16 taxa). The most abundant taxa were snails (*P.antipodarum*), shrimps (*G.pulex*), pea mussels (Sphaeriidae), Oligochaeta worms, non-biting midge (Chironomidae) and caddisfly larvae (*A.fuscipes*). The ponds also supported at least two more species of caddisfly larvae (*P.conspersa, Micropterna sequax*). This community was indicative of good to very good biological water quality. All species recorded were common and widespread.

3.4.81 A PSYM survey of a pond at 040-IA1-156005 recorded low invertebrate diversity (seven taxa). These comprised common species including water scavenger beetle (*Hydrobius fuscipes*), water flea (Cladocera), Chironomidae, Chaoborus (non-biting midge), mosquito larvae (Culicidae) and Oligochaeta worms. No notable species were recorded.

3.4.82 A PSYM survey of a pond at 040-IA1-156003 recorded low invertebrate diversity (eight taxa), including the common species of water scavenger beetle (*H.fuscipes, Anacaena limbata, A.globulus*), freshwater shrimp (*C.pseudogracilis*), Chironomidae, non-biting midge) and Oligochaeta worms. A PSYM survey of a pond at 040-IA1-156004 recorded a moderate invertebrate diversity (26 taxa). The most abundant species were snails (*P.antipodarum, Bithynia tentacula, G.albus, G.crista, Hippeutis complanata*), pea mussels (Sphaeridae), worms (Oligochaeta) crustaceans (*A.aquaticus, C.pseudogracilis, G.pulex*), Oligochaeta worms, lesser waterboatman (various Corixidae, including *Micronecta scholzi*, Conservation Score 6 and non-biting midge (Chironomidae). The pond also supported a breeding population of damselfly (*C.puella, I.elegans*).

3.4.83 A PSYM survey of the pond at 040-IA1-157002 recorded a moderate invertebrate diversity (18 taxa). The most abundant species were shrimps (*G.pulex*), water louse

(*A.aquaticus*), pea mussels (Sphaeriidae), bugs (Corixidae) and non-biting midge (Chironomidae). The pond also supported at least two species of damselfly (*Pyrrhosoma nymphula, C.puella*), two species of dragonfly (*Libellula quadrimaculata, Aeshna sp*.) and two species of aquatic beetles (*Haliplus confinis*, Dytiscidae). All species were identified as common and widespread.

3.4.84 A PSYM survey of the pond at 040-IA1-157001 recorded a moderate to low invertebrate diversity (12 families). The most abundant taxa were aquatic beetles (Dytiscidae), mayfly larvae (Baetidae), mussels (*Musculium lacustre*), bugs (Corixidae) and non-biting midge (Chironomidae). The pond also supported a family of caddisfly larvae (Limnephilidae).

3.4.85 A PSYM survey of the pond at 040-IA1-157003 recorded a low invertebrate diversity, (eight families). The most abundant taxa were non-biting midge (Chironomidae). The pond also supported mayfly larvae (Baetidae), damselfly larvae (Coenagrionidae), bugs (Corixidae) and water beetles (Dytiscidae).

3.4.86 A PSYM survey of the pond at 040-IA1-157005 recorded a moderate invertebrate diversity (17 families). The most abundant taxa were snails (*R.balthica*), mayfly larvae (Baetidae), bugs (Notonectidae, Corixidae), aquatic beetles (Haliplidae) and non-biting midge (Chironomidae). The pond also supported damselfly larvae (Coenagrionidae), dragonfly larvae (Libellulidae), and four additional families of water beetles (Dytiscidae, Noteridae, Helophoridae, Gyrinidae).

3.4.87 A PSYM survey of a pond at 040-IA1-157004 recorded a moderate invertebrate diversity (23 taxa). The most abundant taxa were snails (*G.truncatula, R.balthica*), mayfly larvae (*C.dipterum*), bugs (Corixidae), aquatic beetles (Dytiscidae, Hydrophilidae) and non-biting midge (Chironomidae). Most of the species recorded were common and widespread, with the exception of the notable dragonfly larvae *Sympetrum sanguineum, Libellula depressa* (Conservation Score 5) and the water beetle *R.suturalis* (Conservation Score 7).

3.4.88 A PSYM survey of a pond at 040-IA1-157007 recorded a moderate invertebrate diversity (17 taxa). The most abundant taxa were mayfly larvae (*C.dipterum*) and non-biting midge (Chironomidae). The pond also supported damselfly larvae (Coenagrionidae), and at least six species of water beetles, including the notable *R.suturalis* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5).

3.4.89 A PSYM survey of the pond at 040-IA1-157008 recorded a moderate to low invertebrate diversity (14 families). The most abundant taxa were dragonfly larvae (Libellulidae), Oligochaeta worms and non-biting midge (Chironomidae). The pond also supported mayfly larvae (*C.dipterum*), damselfly larvae (Coenagrionidae), bugs (Corixidae), snails (S.*palustris, R.balthica*) and three families of water beetles (Dytiscidae, Haliplidae, Hydrophilidae).

3.4.90 A PSYM survey of the pond at 040-IA1-157006 recorded a moderate to low invertebrate diversity (15 families). The most abundant taxa were snails (*Physa sp., R.balthica*), dragonfly larvae (Libellulidae), water beetles (Dytiscidae), and non-biting midge (Chironomidae). The pond also supported mayfly larvae (Baetidae), damselfly

larvae (Coenagrionidae), bugs (Corixidae), and two additional families of water beetles (Haliplidae, Hydrophilidae).

Pendigo Lake

3.4.91 A PSYM survey of Pendigo Lake at 040-IA1-156006 recorded a moderate invertebrate diversity (17 families). The most abundant species were shrimps (*C.pseudogracilis*), Oligochaeta worms and non-biting midge (Chironomidae).

Coleshill & Bannerly Pools SSSI

3.4.92 Warwickshire Biological Records Centre recorded *Hydrometra gracilenta* (Conservation Score 8, 'rare', RDB 3, lesser water measurer) at Coleshill & Bannerly Pools SSSI on 13 April 2005, although the precise water body this originated from was not clear. This was not recorded during field survey.

3.4.93 A rapid pond survey at 040-IA1-158001 indicated low invertebrate diversity (three taxa). One notable species was identified, the diving beetle *Hydroporus neglectus* (Conservation Score 7).

3.4.94 A National Pond Survey at 040-IA1-159001, recorded moderate invertebrate diversity, (21 taxa over two surveys). The most abundant taxa were Oligochaeta worms and shrimps (*C.pseudogracilis*). The pond also supported at least one species of aquatic beetle (*Hydroporus angustatus*), six species of Hemiptera, including the lesser waterboatman of local interest (Conservation Score 5) *S.limitata* and *Callicorixa wollastoni*, two species of caddis (*Holocentropus spp*.) and mayfly larvae (*C.dipterum*).

Coleshill Pool Wood LWS and Brickfield Farm

3.4.95 A PSYM survey of the pond at 040-IA1-158002 recorded a low invertebrate diversity, (seven families). The most abundant taxa were snails (*Bathyomphalus contortus*), and Oligochaeta worms.

3.4.96 A PSYM survey of the pond at 040-IA1-159002 recorded a moderate invertebrate diversity (16 families). The most abundant taxa were snails (*B.contortus*, Lymnaeidae, *H.complanatus*), water louse (*Asellus sp*.), mayfly larvae (Baetidae) and non-biting midge (Chironomidae). The pond also supported bugs (Corixidae), dragonfly (Aeshnidae) and damselfly larvae (*E.najas*) as well as two families of caddis (Limnephilidae, Leptoceridae). Species level identification was not undertaken or required for the assessment of this water body.

3.4.97 A PSYM survey of the pond at 040-IA1-159003 recorded a low invertebrate diversity (five families). The most abundant taxa were microcrustaceans (*Daphnia sp*.), Oligochaeta worms and non-biting midge (Chironomidae). Species level identification was not undertaken or required for the assessment of this water body.

3.4.98 A PSYM survey of the pond at 040-IA1-159004 recorded a moderate to low invertebrate diversity (eleven families). The most abundant taxa were micro-crustaceans (*Daphnia sp*.), shrimps (*C.pseudogracilis*), Diptera larvae (Chaoboridae, Chironomidae non-biting midge) and Oligochaeta worms. Species level identification was not undertaken or required for the assessment of this water body.

3.4.99 Table 8 provides a summary of notable invertebrate species recorded within the Birmingham Interchange and Chelmsley Wood area (CFA24).

Table 8: Summary of notable invertebrate species recorded within CFA24

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Lesser waterboatman	*C.wollastoni*	040-IA1-159001	Pool north of Coleshill Pool	SP 1998 8626	15	15	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-157007	Near Middle Bickenhill Lane	SP 2025 8426	1	1	5 'local'
Diving beetle	*H.neglectus*	040-IA1-158001	Pool south of Coleshill Pool	SP 1991 8589	2	2	7 *'notable' British IUCN red data list: nationally scarce*
Broad-bodied chaser	*L.depressa*	040-IA1-157004	Near Middle Bickenhill Lane	SP 2023 8425	10	10	5 'local'
Lesser waterboatman	*M.scholtzi*	040-IA1-156004	Near Middle Bickenhill Lane	SP 2024 8370	60	60	6 'regionally notable'
Diving beetle	*R.suturalis*	040-IA1-157004	Near Middle Bickenhill Lane	SP 2023 8425	2	2	7 *'notable'*
Diving beetle	*R.suturalis*	040-IA1-157007	Near Middle Bickenhill Lane	SP 2025 8426	3	3	7 *'notable'*
Lesser waterboatman	*S.limitata*	040-IA1-159001	Pool north of Coleshill Pool	SP 1998 8626	3	3	5 'local'
Ruddy darter	*S.sanguineum*	040-IA1-157004	Near Middle Bickenhill Lane	SP 2023 8425	2	2	5 'local'

Notable species

3.4.100 Notable species and diverse communities of invertebrates were recorded at sites in this area. In terms of conservation status and species rarity, the ponds near Middle Bickenhill Lane (040-IA1-157004) and Coleshill & Bannerly Pools SSSI (040-IA1-158001) were identified as supporting invertebrate species of nature conservation interest.

3.4.101 Other ponds in the area and Hollywell Brook were recorded as having moderate invertebrate diversity (and moderate overall quality according to the RICT analysis), although none of the species recorded were of significant nature conservation interest.

Castle Bromwich and Bromford (CFA25)

River Tame SLINC

3.4.102 The River Tame SLINC was surveyed as part of the baseline surveys in autumn 2012 and spring 2013, and is also regularly monitored by the Environment Agency.

3.4.103 The nearest Environment Agency sampling points were located approximately 2km upstream of the land required for the construction of the Proposed Scheme at Castle Bromwich (SP 13900 90200) and 1.5km downstream at Water Orton Bridge (SP 16900 91400).

3.4.104 At the Castle Bromwich site, the Environment Agency data (2002-2003) demonstrated low diversity of invertebrates and BMWP and ASPT scores that were generally indicative of poor biological quality, indicating that the community was affected by poor water quality, pollution and/or other impacts.

3.4.105 At the Water Orton site, the Environment Agency data (2006 - 2011) also demonstrated low diversity of invertebrates and BMWP and ASPT scores that were generally indicative of poor biological quality, indicating that the community was impacted by pollution and other pressures.

3.4.106 No notable species were reported in the Environment Agency data set, although the majority of animals were only recorded at family or higher levels of identification.

3.4.107 Invertebrate surveys of the River Tame SLINC at 040-IA1-165002 recorded a moderate to high invertebrate diversity (25 taxa over two surveys). The most abundant taxa are water louse (*A.aquaticus*), shrimps (*G.pulex*), mayfly larvae (*Baetis sp.*), Oligochaeta worms, leeches (*Erpobdella octoculata*), blackfly larvae (Simuliidae) and non-biting midge (Chironomidae). The River Tame SLINC also supported several species of caddisfly larvae (Hydroptilidae, Rhyacophilidae, Hydropsychidae), mayfly larvae (Ephemerellidae) and snails. All species identified are of low conservation value, with the exception of the regionally notable mayfly larvae *Baetis buceratus* (Conservation Score 6) and snail *G.laevis* (Conservation Score 6) as well as the snail *A.leucostoma* (Conservation Score 5). The CCI (7.6, 7.0) score indicated that the River was of moderate to high conservation value.

3.4.108 The PSI scores (53.3, 42.9) on the River Tame SLINC indicate that the river condition is moderately sedimented.

3.4.109 ASPT (4.4, 3.4) and BMWP (75, 24) scores and RICT analysis demonstrated that the River Tame SLINC at this location was of bad overall quality, using the biological and environmental data collected, suggesting that the community was significantly impacted by water and/or habitat quality issues. There was, however, considerable variation between the samples taken in autumn 2012 and spring 2013 (with higher diversity and scores recorded in autumn 2012).

3.4.110 The LIFE scores (7.56, 7.00) were moderate, indicating that the invertebrate community was characterised by a range of animals that are associated with slow flowing to moderately fast flowing waters.

Plants Brook

3.4.111 Plants Brook was surveyed as part of the baseline surveys in spring 2013, and data were also provided by the Environment Agency.

3.4.112 The nearest Environment Agency sampling points was located approximately 2km upstream of the land required for the construction of the Proposed Scheme at Pype Hayes (SP 13600 92200). At this site, the Environment Agency data (2006-2009) show high diversity of invertebrates and BMWP and ASPT scores were generally indicative of moderate to good biological quality.

3.4.113 No notable species were reported in the Environment Agency data set, although the majority of animals are only recorded at family or higher levels of identification.

3.4.114 An invertebrate survey undertaken on Plants Brook at 040-IA1-166006 recorded a moderate invertebrate diversity (25 taxa). The invertebrate community was dominated by molluscs (*P.antipodarum, A.vortex, Ancylus fluviatlis, Zonitoides sp.* Sphaeriidae), Oligochaeta worms, water louse (*A.aquaticus*) shrimp (*G.pulex*), common baetid mayfly (*B.rhodani*) and non-biting midge larvae (Chironomidae). There were some species that are more sensitive to pollution, notably mayfly (*Caenis luctuosa* and *Serratella ignita*) and caddis (*H.augustipennis, L.lunatus,*Psychomyiidae and *Sericostoma personatum*), suggesting that despite the urban setting, water quality was good and the site is sensitive to water quality impacts. All species recorded were common and widespread. The CCI score (7.2) indicated that the invertebrate community was low conservation value.

3.4.115 The PSI scores (53.6) on Plants Brook indicate that the watercourse is moderately sedimented.

3.4.116 The LIFE scores (7.23) were moderate, indicating that the invertebrate community was characterised by a range of animals that are associated with slow flowing to moderately fast flowing waters.

3.4.117 The species composition recorded, as well ASPT (5.2) and BMWP scores (93) indicated that Plants Brook was of moderate to good biological quality, while RICT analysis showed that Plants Brook at this location was of moderate overall quality. This suggests that the community is moderately impacted by water and/or habitat quality issues.

3.4.118 The LIFE scores from our field survey and Environment Agency data were moderate, indicating that the invertebrate community is characterised by a range of animals that are associated with slow flowing to moderately fast flowing waters.

Park Hall SINC

3.4.119 Invertebrates were sampled in several water bodies in Park Hall SINC.A PSYM survey at 040-IA1-167001 recorded low invertebrate diversity (ten taxa). The most abundant taxa were Diptera larvae (Culicidae and non-biting midge (Chironomidae). The ditch also supported at least four species of water beetles (*Hydroporus sp., Agabus sp., Helophorus sp.* and *H.fuscipes*), bugs (Corixidae) and mayfly larvae (Baetidae).

3.4.120 A PSYM survey at 040-IA1-166007 recorded very high invertebrate diversity (51 taxa over three surveys). The ditch also supported at least 20 species of aquatic beetles (including the notable *H.geminus, R.suturalis* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5), at least nine species of Hemiptera (including the Local (Conservation Score 5) *S.scotti* and *S.limitata*, as well as dragonfly larvae (*L.depressa* (Conservation Score 5), *S.sanguineum* (Conservation Score 5), damselfly larvae (*C.puella*), mayfly larvae (*C.dipterum, C.luctuosa*), snails (*G.truncatula*) and caddisfly larvae (*L.lunatus, L.vittatus*, Leptoceridae).

3.4.121 A PSYM survey of the pond at 040-IA1-165005 recorded a moderate to low invertebrate diversity (ten taxa). The most abundant taxa were water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*), and snails (*Planorbis carinatus, A.vortex*). All species identified were common and widespread. EcoRecord[27] provided records for the diving beetles (*R.suturalis* - Conservation Score 7, *Ilybius guttiger* - Conservation Score 7 and *Ilybius quadriguttatus* - Conservation Score 5) and water scavenger beetle (*Cercyon convexiusculus* - Conservation Score 7) from 2006.

3.4.122 A PSYM survey of the pond at 040-IA1-166005 recorded a high invertebrate diversity, (29 taxa over two surveys). The most abundant taxa are mayfly larvae (*C.dipterum*), and Diptera larvae (Dixidae, Chaoboridae, Culicidae and non-biting midge (Chironomidae)). The pond also supported at least eight species of aquatic beetles (including the notable *H.impressopunctatus* (Conservation Score 5), at least seven species of Hemiptera (including the notable *N.marmorea viridis* (Conservation Score 5), as well as damselfly larvae (*Coenagrion sp.*), mayfly larvae (*C.dipterum*), snails (*G.truncatula, A.leucostoma* (Conservation Score 5)) and caddisfly larvae (*L.lunatus*).

3.4.123 A PSYM survey of the pond at 040-IA1-167003 recorded a very high invertebrate diversity (41 taxa over three surveys). The most abundant taxa were mayfly larvae (*C.dipterum*) and snails (*Physa sp., G.truncatula, R.balthica, P.carinatus*). The pond also supported at least eight species of aquatic beetles (including *H.impressopunctatus* (Conservation Score 5), at least nine species of Hemiptera (Corixidae, Notonectidae, Gerridae), and damselfly larvae (*C.puella*). EcoRecord also provided records of diving beetles (*H.impressopunctatus* - Conservation Score 5 and *H.confluens* - Conservation Score 7) and the water scavenger beetle (*Helophorus longitarsis* -Conservation Score 8) from 2006. This water body is located within the land required for the construction of the Proposed Scheme.

3.4.124 A National Pond Survey at 040-IA1-165004 recorded a very high invertebrate diversity (39 taxa over three surveys). The most abundant taxa were snails (*A.vortex, P.carinatus*), water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*) and mayfly larvae (*C.dipterum*). The pond also supported nine species of snails in total (including the locally notable *A.leucostoma* – Conservation Score 5), at least 11 species of aquatic beetles (Haliplidae, Dytiscidae, Noteridae), including the *I.quadriguttatus* (Conservation Score 5), at least seven species of Hemiptera (Corixidae, Notonectidae, Gerridae, Nepidae), and damselfly larvae (*Coenagrion sp.*).

[27] EcoRecord is the biological record centre for Birmingham and the Black Country (Dudley, Sandwell, Walsall & Wolverhampton).
[27] EcoRecord; The Ecological Database for Birmingham and the Black Country; http://www.ecorecord.org.uk/?q=home; contacted April 2012.

3.4.125 A PSYM survey of the pond at 040-IA1-167004 recorded a high invertebrate diversity (33 taxa over three surveys). The most abundant taxa were Hemiptera (*Sigara lateralis*), Baetidae (*C.dipterum*), Chironomidae (non-biting midge larvae) and microcrustaceans (*Daphnia sp*.). The pond also supported at least 16 species of aquatic beetles (including the nationally scarce *Hygrotus nigrolineatus* (Conservation Score 8), *H.geminus* and *H.confluens* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5). At least seven species of Hemiptera were recorded in total (Corixidae, Notonectidae, Gerridae), as well as caddisfly larvae (*L.lunatus*).

3.4.126 A PSYM survey of the pond at 040-IA1-166001 recorded a moderate invertebrate diversity (18 taxa). The most abundant taxa were snails (*R.balthica, Physa heterostropha, P.carinatus, A.vortex*), water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*) and Hemiptera (*S.lateralis*). The pond also supported Hemiptera species (*Sigara concinna*, Conservation Score 5) as well as water beetles larvae (Dystiscidae). EcoRecord[28] also provided records of *S.concinna* from 2006.

3.4.127 A rapid pond assessment at 040-IA1-167005, recorded a moderate to low invertebrate diversity (12 taxa). The most abundant taxa were water louse (*A.aquaticus*), snails (*Physa fontinalis*), non-biting midge (Chironomidae) and Oligochaeta worms. All species identified were of low conservation status.

3.4.128 A PSYM survey of the pond at 040-IA1-165007 recorded a moderate to low invertebrate diversity (14 taxa). The most abundant taxa were mayfly larvae (*C.dipterum*), damselfly larvae (*C.puella*) and trueflies larvae (Chaoboridae, non-biting midge (Chironomidae)). The pond also supported at least five species of Hemiptera, including *S.limitata* (Conservation Score 5).

3.4.129 A PSYM survey of the pond at 040-IA1-166004, recorded a very high invertebrate diversity (40 taxa over three surveys). The most abundant taxa were water beetles (*Laccophilus minutus, Hydroporus planus*), Hemiptera (*S.lateralis*), and trueflies larvae (Chaoboridae, Ceratopogonidae, Chironomidae). The pond also supported at least 14 species of aquatic beetles (including *H.nigrolineatus* (Conservation Score 8) and *H.confluens, H.geminus* and *H.lividus* (Conservation Score 7), at least six species of Hemiptera (including the local *C.wollastoni* (Conservation Score 5), as well as caddisfly larvae (Leptoceridae).

3.4.130 A PSYM survey of the pond at 040-IA1-167002 recorded high invertebrate diversity (35 taxa over three surveys). The most abundant taxa are water beetles (*L.minutus*), Hemiptera (*S.lateralis, Corixa punctata*), mayfly larvae (*C.dipterum*) and truefly larvae (Culicidae, Chironomidae). The pond also supported at least 13 species of aquatic beetles (including *H.nigrolineatus* (Conservation Score 8), *H.geminus* and *H.confluens* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5), at least seven species of Hemiptera (Gerridae, Notonectidae, Corixidae), including *S.concinna* (Conservation Score 5) and damselfly larvae (Coenagrionidae).

[28] EcoRecord is the biological record centre for Birmingham and the Black Country (Dudley, Sandwell, Walsall & Wolverhampton).
[28] EcoRecord; The Ecological Database for Birmingham and the Black Country; http://www.ecorecord.org.uk/?q=home; contacted April 2012.

3.4.131 A PSYM survey of the pond at 040-IA1-166008 recorded a very high invertebrate diversity (44 taxa over three surveys). The most abundant taxa were water beetles (Dytiscidae), Hemiptera (*S.lateralis, C.punctata, Callicorixa praeusta, Gerris thoracicus* and *C.wollastoni* and *S.concinna* (Conservation Score 5), mayfly larvae (*C.dipterum*), shrimps (*C.pseudogracilis*), microcrustaceans (*Daphnia sp.*, Ostracoda) snails (*Physa sp., R.balthica*) and truefly larvae (Culicidae, Chironomidae). The pond also supported at least 12 species of aquatic beetles (including the nationally scarce *H.nigrolineatus* (Conservation Score 8), *H.geminus* and *H.confluens* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5). At least 10 species of Hemiptera (including *S.concinna* (Conservation Score 5), as well as damselfly larvae (*I.elegans*) and caddisfly larvae (*M.longicornis*) were also recorded.

3.4.132 A rapid pond assessment survey at 040-IA1-166008 recorded a low invertebrate diversity (four taxa). These taxa were mostly pollution tolerant taxa (*Asellus sp.*, Chironomidae, Culicidae and one Corixidae) and are indicative poor water quality.

3.4.133 A PSYM survey of the pond at 040-IA1-166003 recorded a moderate invertebrate diversity (19 taxa). The most abundant taxa were snails (*A.vortex, R.balthica, P.corneus*), shrimps (*C.pseudogracilis*), water louse (*A.aquaticus*), pea mussels (Sphaeriidae) and non-biting midge (Chironomidae). The pond also supported at least three species of Hemiptera (Corixidae) and two species of water beetles. All species identified were common and widespread.

3.4.134 A National Pond Survey at 040-IA1-165001 recorded a very high invertebrate diversity, (42 taxa over three surveys). The most abundant taxa were water louse (*A.aquaticus*), shrimps (*C.pseudogracilis*), Oligochaeta worms, pea mussels (Sphaeriidae), and snails (*R.balthica, P.carinatus, A.vortex, H.complanatus* and the local *A.leucostoma* (Conservation Score 5). The pond also supported at least 14 species of aquatic beetles (including *I.guttiger* (Conservation Score 7) and *H.impressopunctatus* (Conservation Score 5), a total of 10 species of snails, as well as caddisfly larvae (*Limnephilus flavicornis grp., L.lunatus*), one species of leeches, *Erpodbella testacea* (Conservation Score 5) and Hemiptera (Corixidae). EcoRecord[29] also provided records of diving beetles (*H.impressopunctatus and I.quadriguttatus* - both with a Conservation Score of 5) were recorded in the Drainage Channels during 2006.

Land north of Park Hall SINC

3.4.135 Several ponds (former sewage lagoons) were surveyed in this site following rapid assessment methods. Species level identification was not undertaken or required for the assessment of any of these water bodies.

3.4.136 A rapid pond assessment survey at 040-IA1-166002 recorded a low invertebrate diversity (two taxa). These were both pollution tolerant taxa (Oligochaeta, Chironomidae), indicative poor water quality. A rapid pond assessment survey at 040-IA1-165006 recorded a low invertebrate diversity (three taxa). These were mostly

[29] EcoRecord is the biological record centre for Birmingham and the Black Country (Dudley, Sandwell, Walsall & Wolverhampton). EcoRecord; The Ecological Database for Birmingham and the Black Country; http://www.ecorecord.org.uk/?q=home; contacted April 2012.

pollution tolerant taxa (Oligochaeta, Chironomidae and one Dytiscidae larvae) and are indicative poor water quality.

3.4.137 A rapid pond assessment survey at 040-IA1-165003 recorded a low invertebrate diversity (four taxa). These were all pollution tolerant taxa (Oligochaeta, Syrphidae, Diptera pupae and Lepidoptera) and are indicative poor water quality.

Dunlop Channel

3.4.138 A ditch survey at 040-IA1-167006 recorded a moderate to low invertebrate diversity, (thirteen taxa). These were dominated by pollution tolerant animals, such as water louse (*A.aquaticus*), shrimps (*G.pulex*), mayfly larvae (*B.rhodani*), Oligochaeta worms, blackfly larvae (*Simulium sp*.) and non-biting midge (Chironomidae). All species recorded are common and widespread. This community was indicative of poor biological water quality.

3.4.139 Table 9 provides a summary of notable invertebrate species recorded within the Castle Bromwich and Bromford area (CFA25).

Table 9: Summary of notable invertebrate species recorded within CFA25

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Button Ramshorn Snail	*A.leucostoma*	040-IA1-166005	Park Hall SINC	SP 1491 9049	11	10	5 'local'
Button Ramshorn Snail	*A.leucostoma*	040-IA1-165001	Park Hall SINC	SP 1611 9093	16	16	5 'local'
Mayfly	*B.buceratus*	040-IA1-165002	Park Hall SINC	SP 1610 9105	276	276	6 'regionally notable'
Lesser waterboatman	*C.wollastoni*	040-IA1-166004	Park Hall SINC	SP 1499 9063	3	3	5 'local'
Lesser waterboatman	*C.wollastoni*	040-IA1-166008	Park Hall SINC	SP 1486 9054	14	11	5 'local'
Leech	*E.testacea*	040-IA1-165001	Park Hall SINC	SP 1611 9093	3	3	5 'local'
Water scavenger beetle	*H.lividus*	040-IA1-166004	Park Hall SINC	SP 1499 9063	1	1	7 *'notable'*
Diving beetle	*H.geminus*	040-IA1-166007	Park Hall SINC	SP 2183 8087	6	6	7 *'notable'*
Diving beetle	*H.geminus*	040-IA1-166004	Park Hall SINC	SP 1499 9063	8	5	7 *'notable'*

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Diving beetle	*H.geminus*	040-IA1-167002	Park Hall SINC	SP 14824 90436	2	1	7 *'notable'*
Diving beetle	*H.geminus*	040-IA1-166008	Park Hall SINC	SP 1486 9054	1	1	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-167004	Park Hall SINC	SP 1484 9038	22	13	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-166004	Park Hall SINC	SP 1499 9063	27	13	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-167002	Park Hall SINC	SP 14824 90436	21	10	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-166008	Park Hall SINC	SP 1486 9054	2	1	7 *'notable'*
Diving beetle	*H.confluens*	040-IA1-167004	Park Hall SINC	SP 1484 9038	6	6	7 *'notable'*
Diving beetle	*H.impressopunctatus*	040-IA1-166007	Park Hall SINC	SP 2183 8087	13	7	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-166005	Park Hall SINC	SP 1491 9049	1	1	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-166005	Park Hall SINC	SP 1484 9053	11	8	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-166004	Park Hall SINC	SP 1499 9063	9	9	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-166008	Park Hall SINC	SP 1486 9054	9	6	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-165001	Park Hall SINC	SP 1611 9093	2	2	5 'local'
Diving beetle	*H.impressopunctatus*	040-IA1-167002	Park Hall SINC	SP 14824 90436	3	3	5 'local'
Diving beetle	*H.nigrolineatus*	040-IA1-167004	Park Hall SINC	SP 1484 9038	2 5 7 2	1 2 5 1	8 *'nationally rare'* *British IUCN:*

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
					1	1	*nationally scarce*
Diving beetle	*H.nigrolineatus*	040-IA1-166004	Park Hall SINC	SP 1499 9063	5	2	8 *'nationally rare' British IUCN: nationally scarce*
Diving beetle	*H.nigrolineatus*	040-IA1-167002	Park Hall SINC	SP 14824 90436	7	5	8 *'nationally rare' British IUCN: nationally scarce*
Diving beetle	*H.nigrolineatus*	040-IA1-166008	Park Hall SINC	SP 1486 9054	2	1	8 *'nationally rare' British IUCN: nationally scarce*
Diving beetle	*H.nigrolineatus*	040-IA1-167004	Park Hall SINC	SP 1484 9038	1	1	8 *'nationally rare' British IUCN: nationally scarce*
Diving beetle	*I.guttiger*	040-IA1-165001	Park Hall SINC	SP 1611 9093	3	2	7 *'notable'*
Diving beetle	*I.quadriguttatus*	040-IA1-165004	Park Hall SINC	SP 1594 9085	1	1	5 'local'
Broad-bodied chaser	*L.depressa*	040-IA1-166007	Park Hall SINC	SP 2183 8087	17	0	5 'local'
Greater waterboatman	*N.marmorea viridis*	040-IA1-166005	Park Hall SINC	SP 1491 9049	12	12	5 'local'
Diving beetle	*R.suturalis*	040-IA1-166007	Park Hall SINC	SP 2183 8087	2	2	7 *'notable'*
Lesser waterboatman	*S.concinna*	040-IA1-166008	Park Hall SINC	SP 1486 9054	3	3	5 'local'
Lesser waterboatman	*S.concinna*	040-IA1-167004	Park Hall SINC	SP 1484 9038	2	2	5 'local'
Lesser waterboatman	*S.concinna*	040-IA1-167002	Park Hall SINC	SP 14824 90436	8	8	5 'local'
Lesser waterboatman	*S.concinna*	040-IA1-166008	Park Hall SINC	SP 1486 9054	1	1	5 'local'

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Lesser waterboatman	*S.limitata*	040-IA1-166007	Park Hall SINC	SP 2183 8087	2	2	5 'local'
Lesser waterboatman	*S.scotti*	040-IA1-166007	Park Hall SINC	SP 2183 8087	2	2	5 'local'
Ruddy darter	*S.sanguineum*	040-IA1-166007	Park Hall SINC	SP 2183 8087	4	0	5 'local'

Notable species

3.4.140 Certain ponds and ditches within Park Hall SINC are of high importance, in terms of the invertebrate species and communities present (rarity, nature conservation status and taxa diversity). Field survey results confirm the desk study results of the survey undertaken at the same site in 2006[30].

3.4.141 The most diverse sites within Park Hall SINC were generally the more recently created ponds and ditches, with low vegetation levels, notably 040-IA1-166007, 040-IA1-166004, 040-IA1-167003 and 040-IA1-166005. The most dominant taxa were beetles and true bugs (Hemiptera). Older and highly vegetated ponds were generally less diverse, with the exception of 040-IA1-165004. This is likely linked to the water quality, but also the high vegetation cover, in particular the non-native invasive fern species *Azolla filiculoides*. In the older ponds, the macro-invertebrate assemblages were generally dominated by snails and crustaceans.

3.4.142 Many of the species recorded were relatively common and widespread. However, among the most important species collected, five beetle species were classified as notable (Conservation Score: 7) and comprise *H.geminus, H.confluens, R.suturalis, H.lividus* and *I.guttiger*. These species are considered scarce in Great Britain and thought to occur in fewer than 100 10km squares of the National Grid. Also *H.nigrolineatus*, a species of beetle classified as rare (Conservation Score 8) and Nationally Scarce based on post 2006 IUCN criteria[31] (formerly RBD3 status), appears to be present in many of the ponds in Park Hall SINC, and was recorded in New Pond 2 and New Scrape 2, Kidney Pond and New Ditch 2.

3.4.143 The water bodies in Park Hall SINC that were recently created and are largely devoid of aquatic vegetation were characterised by the most diverse invertebrate communities. The samples taken in these newly created ponds were generally dominated by beetle larvae. The success of these ponds was likely due to their age and, in many cases, the absence of vegetation (beetles are often considered as being pioneer species). The water bodies in Park Hall SINC are highly connective to each

[30] Pisolkar, E. (2007). *Park Hall Farm, Birmingham – Freshwater Macro-invertebrate Survey*. Report by Pisolkar E, Environmental Consultant.
[31] Foster, G.N. (2010), *A review of the scarce and threatened Coleoptera of Great Britain Part 3 - Water beetles of Great Britain.* Species Status 1. Joint Nature Conservation Committee, Peterborough.

other and the River Tame SLINC, and *H.nigrolineatus* has been recorded on the River Tame SINC.

3.4.144 The invertebrate community sampled in the River Tame SLINC (near to Park Hall SINC) was characterised by a moderate diversity. Some relatively pollution sensitive taxa were recorded in autumn 2012 (but not in spring 2013), such as mayfly larvae (*S.ignita*) and caddisfly larvae (*R.dorsalis*). This water body scored as bad quality as derived by RICT analysis (using the biological and environmental data collected). For a river of this size and type, higher diversity and abundance of pollution sensitive taxa would be expected if water quality was good and no species of significant nature conservation were recorded. Plants Brook, however, appeared to be of better quality (moderate overall quality according to the RICT analysis), and included several pollution sensitive species (none of which were of significant conservation importance), despite the urban setting.

Washwood Heath to Curzon Street (CFA26)

River Rea SLINC

3.4.145 The River Rea SLINC was not accessible for invertebrate surveys (as discussed earlier in this document) within the vicinity of the land required for the construction of the Proposed Scheme.

3.4.146 The nearest Environment Agency data was from approximately 5km upstream (SP 06110 82400) in the Selly Park area of Birmingham (Kitchener Road sampling site). At this site, the Environment Agency data (2003-2006) demonstrate low diversity of invertebrates and BMWP and ASPT scores that were generally indicative of moderate to poor biological quality (with low numbers of pollution sensitive taxa recorded), indicating that the community was affected by poor water quality, pollution and/or other impacts. The biological quality is likely to be similar or worse at the location of the land required for the construction of the Proposed Scheme, given the poor habitat quality (brick-lined and canalised stream) and the urban surrounding area and associated activities.

3.4.147 No notable species were reported in the Environment Agency data set, although the majority of animals were only recorded at family or higher levels of identification.

3.4.148 The LIFE scores Environment Agency data were moderate, indicating that the invertebrate community was characterised by a range of animals that were associated with slow flowing to fast flowing waters.

Grand Union Canal SLINC

3.4.149 A PSYM survey of the Grand Union Canal SLINC at 040-IA1-173001 recorded a low invertebrate diversity (five taxa). These were dominated by common and pollution tolerant groups only, such as Oligochaeta worms, non-biting midge (Chironomidae). This community was indicative of a poor biological water quality.

Digbeth Branch Canal SLINC

3.4.150 A PSYM survey of the Digbeth Branch Canal SLINC at 040-IA1-174001 recorded a moderate to high invertebrate diversity (23 taxa over two surveys). The most abundant taxa were snails (*R.balthica*), water louse (*A.aquaticus*), shrimps

(*C.pseudogracilis*), caddisfly larvae (four species of Polycentropodidae) and non-biting midge (Chironomidae). The canal also supported leeches (*E.octoculata*), damselfly larvae (*C.puella*), bugs (*Gerris lacustris, C.punctata, Sigara nigrolineata*), a species of aquatic beetles (*Enochrus testaceus*) and at least four other species of caddisfly larvae (A.*aterrimus*, *M.longicornis*, *L.lunatus* and *Phryganea bipunctata*). This community is indicative of good to very good biological water quality. Most of the taxa recorded are common and widespread, with the exception of the caddisfly larvae *Cyrnus flavidus* (Conservation Score 5).

Notable Species Summary

3.4.151 In terms of rarity and conservation status, none of the water bodies sampled within this section of the land required for the Proposed Scheme were of significant nature conservation interest. The Digbeth Branch Canal SLINC (040-IA1-174001) is, however, noteworthy for its high diversity of aquatic invertebrate species.

3.4.152 Table 10 provides a summary of notable invertebrate species recorded within the Washwood Heath to Curzon Street area (CFA26).

Table 10: Summary of notable invertebrate species recorded within CFA26

Common name	Scientific name	Ecology survey code	Location	OS grid ref	Number recorded	Maximum number of specimens	Conservation Score*
Caddis larvae	*C.flavidus*	040-IA1-174001	Digbeth Branch Canal SLINC	SP 09305 88451	10	2	5 'local'

4 White-clawed crayfish

4.1 Introduction

4.1.1 This section of the appendix presents a summary of the baseline data relating to white-clawed crayfish (*Austropotamobius pallipes*) for the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive.

4.2 Methodology

4.2.1 Details of the standard methodology for white-clawed crayfish survey are provided in Ecology Technical Note: Ecological field survey methods and standards (Volume 5: Appendix CT-001-000/2).

4.2.2 Desk study records relating to white-clawed crayfish were obtained from consultation with and publications by the Environment Agency.

4.2.3 There were limited desk study records relating to the survey area and very few for watercourses and water bodies which were identified for survey. Consultation was therefore undertaken with the Environment Agency to help target survey effort on those habitats with potential to support white-clawed crayfish. Through consultation it was determined that all major rivers within the survey area (the River Tame, River Cole and River Blythe) and the majority of their tributaries, were known to be colonised by American signal crayfish (*Pacifastacus leniusculus*). Therefore the only locations with the potential for white-clawed crayfish were the tributaries of the River Blythe which were already identified in the desk study and scoping stages as watercourses requiring survey.

4.2.4 Table 11 identifies watercourses and water bodies subject to survey and the various methods employed at each, and are displayed on Volume 5: Map series: EC-11.

Table 11: Summary of surveys for white-clawed crayfish undertaken within CFA23, CFA24, CFA25 and CFA26 inclusive

Ecology Survey Code	Location	Survey method and survey dates			CFA
		Scoping visit	Manual search	Trapping	
040-WC3-153001	River Blythe SSSI at Marsh Lane Nature Reserve SP 21550 80960 - SP 21538 80844	06 September 2012	Yes	Yes (netting)	23
040-WC3-154001	River Blythe SSSI SP 21351 81729 -to SP 21561 81141	11 September 2012	Yes	Yes (netting)	23
040-WC3-154002	River Blythe SSSI SP 21797 81721 - SP 22031 82085	11 September 2012	Yes	Yes (netting)	23
040-WC3-155002	Shadow Brook SP 21160 82370 - SP 21024 82394	05 September 2012	Yes	Yes (netting)	23
040-WC3-155003	Pond SP 20750 82730	03 September 20/12	Yes	Yes (netting)	23
040-WC3-155001	River Blythe SSSI SP 21408 83194 - SP 21443 83074	12 September 2012	Yes	Yes (netting)	24

Ecology Survey Code	Location	Survey method and survey dates			CFA
		Scoping visit	Manual search	Trapping	
040-WC3-156001	Hollywell Brook SP 20870 83560 - SP 21007 83601	12 September 2012	Yes	Yes (netting)	24
040-WC3-166001; 040-WC3-166003	River Tame SLINC at Park Hall SINC SP 15898 90963 - SP 16117 91079	18 September 2012	Yes	Yes (netting)	25
040-WC3-166002	Plants Brook SP 14869 90899 - SP 15181 90847	23 May 2013	Yes	Yes (netting)	25

4.3 Deviations, constraints and limitations

4.3.1 All areas considered necessary for survey were fully accessible and the surveys were undertaken in accordance with the methodology.

4.4 Baseline

4.4.1 Scoping surveys and incidental records identified land parcels with the potential to support white-clawed crayfish, and the locations of established populations of American signal crayfish. Aquatic invertebrate and riparian mammal surveys also provided valuable records that assisted in determining the scope of further survey for crayfish and the validity of desk based records.

4.4.2 Table 12 provides details of water bodies that were scoped out of the requirement for detailed surveys and the rational for this.

Table 12: Rationale for scoping out requirement for further survey of watercourses/water bodies in CFA23, CFA24, CFA25 and CFA26 inclusive

Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
Bayleys Brook	East of Truggist Lane extending west to Lavender Hall Lane	SP 24069 78425 - SP 24925 77057	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment.	23
Tributary and pond	East of Bayleys Brook	SP 24230 78236 - SP 24452 78301	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23
Five ponds	Lavender Hall Fisheries	SP 24373 77765	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment.	23
Ponds	At Beechwood Farm	SP 25496 77313	There are confirmed records of non-native crayfish within 1km of the land required for the Proposed Scheme as measured along the watercourse	23
Tributary	West of Beechwood Farm	SP 25649 76815 - SP 24952 76999	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23
Pond	West of Truggist Lane	SP 25207 77447	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23

Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
Bayleys Brook and watercourse running parallel	Wood east of Berkswell Marsh SSSI	SP 21792 80272 - SP 22720 79746 SP 22572 80092 - SP 22894 79852	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23
Pond	North of Kenilworth Road and Bradnocks Marsh Lane roundabout	SP 22283 79560	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse. (Signal Crayfish in River Blythe)	23
Ponds	On the corner of Marsh Lane and A452 Kenilworth Road	SP 21712 80452	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse. (Signal Crayfish in River Blythe) Incidental records of signal crayfish identified during protected species surveys – observed whilst torching Marsh Lane Nature Reserve ponds for great crested newts	23
Pond	At Lavender Hall Farm	SP 23891 78189	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse	23
Ponds	East of Lavender Hall Farm	SP 23676 78222	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23
Pond	On the corner of Park Lane and A452 Kenilworth Road	SP 23254 78674	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse	23
Horn Brook and tributary	Running east and west of A452 Kenilworth Road	SP 21705 80804 - SP 22016 81024 SP 21811 81343 - SP 22391 81326 SP 22360 81139 - SP 22016 81024	Consultation with the Environmental Agency There are records of non-native crayfish up to 5km from the land required for the construction of the Proposed Scheme, both upstream and downstream on the watercourse and there is likely continuous population of non-native crayfish between them. Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	23
Hollywell Brook	Extending east of Chester Road to the M42	SP 21249 83736 - SP 19925 83634	Consultation with the Environmental Agency There are records of non-native crayfish up to 5km from the land required for the construction of the Proposed Scheme, both upstream and downstream on the watercourse and there is likely continuous population of non-native crayfish between them. Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	24
Tributary	South of Packington Lane	SP 20893 84344 - SP 21193 84203	Consultation with the Environmental Agency There are records of non-native crayfish up to 5km from the land required for the construction of the Proposed Scheme, both upstream and downstream on the watercourse and there is likely continuous population of non-native crayfish between them.	24

Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
			Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	
Two ponds	South of Packington Lane	SP 20818 84243	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse. (Signal Crayfish in River Blythe)	24
Ponds	North of Middle Bickenhill Lane	SP 20249 84280	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse. (Signal Crayfish in River Blythe)	24
Watercourse	Crossing under the Stonebridge Road and Chester Road to Fishpool Lane	SP 19958 84469 - SP 20674 84525	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse (Signal Crayfish in River Blythe)	24
Pond	East of Stonebridge Road and Chester Road intersection	SP 20390 84707	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along a watercourse (Signal Crayfish in River Blythe)	24
Pond	North of East Way and Coventry Road	SP 20755 83219	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along a watercourse (Signal Crayfish in River Blythe)	24
Lake	At Pendigo Way	SP 19345 83516	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along a watercourse (Signal Crayfish in River Blythe)	24
Pond	East of Bickenhill Lane and south of Station Link Road	SP 18678 83570	Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	24
Three ponds	Land north of Coleshill Pool Wood LWS	SP 19413 86294	Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment The pond is located between River Blythe and River Cole which both support signal crayfish	24
Pond	South of Solihull Parkway roundabout	SP 19460 85369	Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment	24
Ponds	Within the land north of Park Hall SINC	SP 15739 91155	There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along a watercourse Water quality is poor	25
Ponds	At Park Hall SINC	SP 15730 90847	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment. There are confirmed records of non-native crayfish within 1km of the land required for the construction of the	25

Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
			Proposed Scheme as measured along the watercourse	
Dunlop Channel	Cadbury Drive and Fort Parkway	SP 14724 90679 - SP 13113 90383	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse	25
River Tame SLINC	Along the M6 to Tameside Drive	SP 15788 90950 - SP 13300 90199 SP 12101 89833 - SP 11129 89806	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment There are records of non-native crayfish up to 5km from the land required for the construction of the Proposed Scheme, both upstream and downstream on the watercourse and there is likely continuous population of non-native crayfish between them. Water quality has been poor within the past 10 years and there are no populations of white-clawed crayfish in connected tributaries within 2km.	25
River Rea SLINC	Along Heartlands Parkway to Mainstream Way	SP 10783 89625 - SP 10163 89453 SP 09761 89332 - SP 08604 87307	Consultation with the Environmental Agency Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment There are confirmed records of non-native crayfish within 1km of the land required for the construction of the Proposed Scheme as measured along the watercourse (signal crayfish in the River Tame)	26
Grand Union Canal SLINC	Along Heartlands Parkway to Duddeston Mill Road	SP 09585 89041 - SP 09388 87738	Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment (signal crayfish in the River Tame)	26
Digbeth Branch Canal SLINC	At Curzon Street	SP 08094 87429 - SP 08122 87116	Best available information indicates there are no white-clawed crayfish remaining in the sub-catchment (signal crayfish in the River Tame)	26

4.4.3 Table 13 provides a summary of the sites where detailed field surveys were undertaken.

Table 13: Summary of crayfish records from surveys undertaken in CFA23, CFA24, CFA25 and CFA26 inclusive

Ecology survey code	Location and watercourse	OS grid reference	Species recorded and number	Survey method yielding record	CFA	Distance from land required for the construction of the Proposed Scheme[32] (m)
040-WC3-153001	River Blythe SSSI (at Marsh Lane Nature Reserve)	SP 21550 80960 - SP 21538 80844	White-clawed crayfish (0)	Manual refuge search and netting	23	100m, south-west

[32]The phrase 'Within land required' represents an abbreviation of this term

Ecology survey code	Location and watercourse	OS grid reference	Species recorded and number	Survey method yielding record	CFA	Distance from land required for the construction of the Proposed Scheme[32] (m)
040-WC3-154001	River Blythe SSSI - Stretch of river north and south of Meriden Road, including the B4102 Meriden Road underbridge, Hampton-in-Arden	SP 21351 81729 - SP 21561 81141	White-clawed crayfish (0)	Manual refuge search and netting	23	Within land required
040-WC3-154002	River Blythe SSSI at Meriden Mill Farm, west of A452	SP 21797 81721 - SP 22031 82085	White-clawed crayfish (0)	Manual refuge search and netting	23	340m, north-west
040-WC3-155001	River Blythe SSSI at Stonebridge, intersection of A45 and A452	SP 21408 83194	White-clawed crayfish (0)	Manual refuge search and netting	24	Within land required
040-WC3-155002	Shadow Brook	SP 21160 82370	White-clawed crayfish (0)	Manual refuge search and netting	23	Within land required
040-WC3-155003	Pond at Pasture Farm	SP 20750 82730	White-clawed crayfish (0)	Manual refuge search and netting	23	150m, south-west
040-WC3-156001	Hollywell Brook west of A452 Chester Road	SP 20870 83560	White-clawed crayfish (0)	Manual refuge search and netting	24	Within land required
040-WC3-166001 040-WC3-166003	River Tame SLINC at Park Hall SINC	SP 15898 90963 - SP 16117 91079	White-clawed crayfish (0)	Manual refuge search and netting	25	Within land required
040-WC3-166002	Plants Brook, north of Park Hall SINC	SP 14869 90899 - SP 15181 90847	White-clawed crayfish (0)	Manual refuge search and netting	25	Within land required

4.4.4 There were no white-clawed crayfish recorded in any of the watercourses or water bodies surveyed.

Balsall Common and Hampton-in-Arden (CFA23)

4.4.5 Desk based records and consultation with the Environment Agency established two locations as having potential to support white-clawed crayfish. These were Shadow Brook and Horn Brook, both of which are tributaries of the River Blythe. Dedicated surveys carried out on these sites identified only American signal crayfish as present, making the presence of white-clawed crayfish very unlikely.

Chelmsley Wood and Birmingham Interchange (CFA24)

4.4.6 There are two records of white-clawed crayfish from 1998 and 1999 for a single location at SP 217 852 on the River Blythe, north of School Lane, and a further record from 1998 for SP 226 835, though it is not clear whether this record is also from the River Blythe or one of the two pools that exist on the site (Hall Pool and Great Pool). Owing to their age, these records were not considered to represent a reliable indication of the current presence of white-clawed crayfish in these localities.

4.4.7 Hollywell Brook, a tributary of the River Blythe was identified during discussions with the Environment Agency as having the potential to support white-clawed crayfish; however dedicated crayfish surveys only identified American signal crayfish as present on this tributary. Incidental records obtained by other protected species surveys during 2012 likewise identified this watercourse as supporting a large population of American signal crayfish, which were present along the entire length surveyed.

4.4.8 Few sites were selected for survey in this area owing to the presence of the American signal crayfish within these watercourses. Surveys likewise identified only American signal crayfish as present within watercourses of this area.

Castle Bromwich and Bromford (CFA25)

4.4.9 Four desk study records from 2003, 2004 and 2005 indicated the presence of white-clawed crayfish at a single location on Plants Brook Nature Reserve adjacent to the A38 (grid reference SP 141 921). This location lies outside the survey area and was also separated from Plants Brook (a watercourse which is within the land required for the construction of the Proposed Scheme), by a culvert which is approximately 1.75km long. This culvert provides a physical barrier to the movement of non-native crayfish to the known population of white-clawed crayfish upstream.

4.4.10 Plants Brook was identified by The Environment Agency as supporting white-clawed crayfish 1.75km upstream of the culverted section of Plants Brook. A survey for white-clawed crayfish was carried out downstream of the culvert, which lies within the land required for the construction of the Proposed Scheme, to investigate whether white-clawed crayfish were present. The section of Plants Brook was surveyed in May 2013, however, the channel was found to be unsuitable habitat for white-clawed crayfish.

4.4.11 The River Tame SLINC was identified by the Environment Agency as supporting signal crayfish, however, a refugia search and netting survey of Park Hall SINC was carried out to determine whether a remnant population of white-clawed crayfish was present in Park Hall SINC. The survey, however, did not return any crayfish (native or non-native) results. Further survey was not considered necessary as subsequent research identified both water quality and signal crayfish as impediments to re-colonisation by white-clawed crayfish[33].

[33] Environment Agency, (2011), River Tame Flood Risk Management Strategy, May 2011: Statement of Environmental Particulars, Environment Agency, Solihull.

Washford Heath to Curzon Street area (CFA26)

4.4.12 Desk study records, consultation with the Environment Agency and web based research did not identify any watercourses within this area as likely to support white-clawed crayfish. Hence, no surveys were conducted within this area.

5 Fish

5.1 Introduction

5.1.1 This section of the appendix presents details of the baseline information relating to fish for the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive.

5.2 Methodology

5.2.1 Fish survey requirements were devised in accordance with Water Framework Directive survey techniques and the standard methodology provided in Ecology Technical Note: Ecological field survey methods and standards (Volume 5: Appendix CT-001-000/2).

5.2.2 Consultation was undertaken with the Environmental Agency to help target fish surveys, however, no reliable recent data was received for water bodies within the land required for the construction of the Proposed Scheme. Watercourses that were known or suspected of fisheries interest that were crossed by the Proposed Scheme were therefore, subject to survey. These survey sites were identified from aerial photography and surveys were undertaken by ECON Ecological Consultancy Ltd.

5.2.3 A summary of locations at which fish surveys were undertaken within the section of the Proposed Scheme that will pass through CFA23, CFA24, CFA25 and CFA26 inclusive is provided in Table 14 and shown in Volume 5: Map series EC-11. No suitable habitat was present within the Washwood Heath to Curzon Street area (CFA26).

Table 14: Summary of fish survey locations

Ecology survey code	Watercourse/ feature	Survey date	Survey methods utilised	CFA	Distance from land required for the construction of the Proposed Scheme[34] (m)
040-FI1-149001	Bayleys Brook (stream)	26 June 2013	Depletion catch electro-fishing	23	Within land required
040-FI1-154001	River Blythe SSSI (river)	26 June 2013	Depletion catch electro-fishing	23	Within land required
040-FI1-155001	Shadow Brook (stream)	26 June 2013	Depletion catch electro-fishing	23	Within land required
040-FI1-156001	Hollywell Brook (stream)	25 June 2013	Depletion catch electro-fishing	24	Within land required
040-FI1-166001	River Tame SLINC (main river)	25 June 2013	Depletion catch electro-fishing	25	Within land required

[34]The phrase 'Within land required' represents an abbreviation of this term

5.3 Deviations, constraints and limitations

5.3.1 Access was available at all sites identified requiring fish survey.

5.3.2 The Water Framework Directive and the survey methodology has been fully adhered to, with exceptions of:

- all fish were recorded and measured in millimetres (mm);
- Bayleys Brook (040-FI1-149001) and Shadow Brook (040-FI1-155001) survey sites were restricted to a 50m survey area due to the overgrown nature of the riparian zone;
- the River Blythe SSSI (040-FI1-154001) around Patrick Farm varied in depth greatly and the longest stretch which could be surveyed was assessed by either wading along the watercourse or with use of boat;
- Hollywell Brook (040-FI1-156001) was surveyed using electric fishing equipment though the survey was limited due to site access constraints; and
- the River Tame SLINC (040-FI1-166001) was depletion catch electro-fished without the survey area being delimited by stop nets. In addition, this river could not be accessed by boat due to steep banks. Consequently, a representative stretch of the river was sampled by a surveyor who waded along the watercourse.

5.4 Baseline

5.4.1 No recent desk study results were available for watercourses within the land required for the construction of the Proposed Scheme. All major rivers suspected of fisheries interest were subject to survey.

5.4.2 A summary of results from fish surveys conducted through CFA23, CFA24, CFA25 and CFA26 are detailed in

5.4.3 Table 15.

Table 15 Summary of results from fish surveys conducted in CFA23, CFA24, CFA25 and CFA26 inclusive

Ecology survey code	Watercourse	Description of location	Average width (m)	Fish habitat quality score	Species	Catch per 100m² (Total catch)	CFA
040-FI1-149001	Bayleys Brook	South-east of Lavender Hall Lane,	1.25	Poor[35]	Roach (*Rutilus rutilus)*	62.545 (43)	23

[35] Habitats with minimal variation. Substrate diversity limited. No bankside/marginal cover for fish. In-stream and marginal (where present) typically limited to single dominating species. No substrate available for spawning salmonids. Water body may receive diffuse, land-based pollution (run-off) and exhibit a high degree of other degradation such as poaching. Barriers to upstream migration (debris/man-made dams) present (where applicable to species concerned).

Ecology survey code	Watercourse	Description of location	Average width (m)	Fish habitat quality score	Species	Catch per 100m² (Total catch)	CFA
		north of Hall meadow Road SP 24246 77977 length of watercourse surveyed: 55m			Three-spined stickleback (*Gasterosteus aculeatus)*	7.273 (6)	
					Bullhead (*Cottus gobio)*	8.727 (5)	
040-Fl1-154001	River Blythe SSSI	Crosses Meriden Road SP 21419 81350 length of watercourse surveyed: 67m	8.50	Moderate[36]	Minnow (*Phoxinus phoxinus*)	46.532 (265)	23
					Stone loach (*Barbatula barbatula*)	7.375 (42)	
					Brown trout (*Salmo trutta*)	0.176 (1)	
					Three-spined stickleback	1.229 (7)	
					Bullhead	7.024 (40)	
040-Fl1-155001	Shadow Brook	West of Diddington Lane SP 20958 82441 length of watercourse surveyed: 50m	1.80	Poor	Three-spined stickleback	12.055 (11)	23
					Bullhead	2.192 (3)	
040-Fl1-156001	Hollywell Brook	Middle Bickenhill Lane SP 20197 83767 length of watercourse surveyed: 50m	1.00	Poor	Common gudgeon (*Gobio gobio*)	4.000 (2)	24
					Chub (*Leuciscus cephalus*)	2.000 (1)	
					Minnow	42.000 (21)	
					Stone loach	6.00 (3)	
					Three-spined stickleback	24.000 (12)	
					Perch (*Perca fluviatilis*)	4.000 (2)	
040-Fl1-166001	River Tame SLINC	North of the M6 SP 14722 90297 length of watercourse	17.50	Moderate	Common gudgeon	1.600 (14)	25
					Minnow	0.229	

[36] For running waters the habitats include a number of flow types throughout the survey reach. Limited substrate diversity. Sparse cover for both juvenile and adult fish. Lower in-stream/body and marginal vegetation diversity. Limited substrate present for spawning salmonids. No evidence of pollution, other degradation (e.g. poaching) may be present. Potential barriers to upstream migration present (where applicable to species concerned).

Ecology survey code	Watercourse	Description of location	Average width (m)	Fish habitat quality score	Species	Catch per 100m² (Total catch)	CFA
		surveyed: 50m				(2)	
					Stone loach	15.771 (138)	
					Three-spined stickleback	1.143 (10)	
					Bullhead	0.800 (7)	

Balsall Common and Hampton-in-Arden area (CFA23)

Bayleys Brook

5.4.4 The site at Bayleys Brook was species poor though with moderate population densities. Although the characteristics of the surveyed stretch were similar to a drain, rather than a stream, the presence of the dominant species, roach, was unexpected, particularly given the distance from the River Blythe SSSI but they could have been a result of introductions or escapees from the fishery to the south during a flood event.

5.4.5 It is likely that the presence of roach was suppressing the three-spined stickleback population.

5.4.6 The surveyed stretch of Bayleys Brook was not particularly suitable to support a strong bullhead population, the small numbers present indicated that conditions were sub-optimal, or that an area of Bayleys Brook, in proximity of the site, may have been more typical of a tributary brook. Bullhead is a species of conservation concern (rare or threatened) in a European context.

River Blythe SSSI

5.4.7 The surveyed stretch of the River Blythe SSSI supported reasonable species diversity with good overall population densities. Whilst scoping the river for a suitable site to survey, large chub and shoals of gudgeon and/or dace (*Leuciscus leuciscus*) were observed, therefore the species diversity in the vicinity of this particular stretch of the River Blythe SSSI was considered to be higher than the survey indicated. The species present in the Blythe SSSI around Patrick Farm was as would be expected for a river of this size and geographic location. The higher levels of species diversity also were reflected in the greater overall population densities of those species present: the highest estimate for these study sites.

5.4.8 The minnow population exhibited good age class structure, with evidence of good recruitment in 2012. Minnows spawn between May and July[37], and with evidence of potential young-of-the-year fish captured in the survey and the presence of females

[37]Maitland, P.S. (2000). *Guide to Freshwater Fish of Britain and Europe*. Hamlyn.

ripe with eggs, protracted spawning events indicated the potential for further good recruitment in 2013.

5.4.9 The recorded density of bullhead was below the threshold suggested to represent a good and viable population (50 individuals per 100m^2 in lowland rivers[38]) but there was evidence of good recruitment of bullhead with 78% of fish captured being either young-of-the-year or born in 2012. This meets the criterion of 50% of a healthy population being represented by young-of-the-year fish at the end of the growing season[37]. The presence of non-native signal crayfish was likely to have been a key factor for the lower density of bullhead than expected from the habitat conditions. The population of stone loach was also likely to have been affected by the presence of signal crayfish.

Shadow Brook

5.4.10 The characteristics of the stretch of Shadow Brook which was surveyed were similar to those of the Bayleys Brook study area. There was no recognisable flow, with the exception of a single riffle which had no associated fish. Only two species were recorded but one of these was bullhead, although at a low density.

Birmingham Interchange and Chelmsley Wood (CFA24)

Hollywell Brook

5.4.11 The site at Hollywell Brook had the most species recorded of those surveyed and also appeared to support reasonable population densities for a small brook. The proximity of the River Blythe SSSI and the connected pond upstream of the site were likely to have been influential in the fish community for such a small brook, as neither perch nor chub would have been expected to be present.

5.4.12 Minnows were present in reasonable numbers, but stone loach numbers were low and bullhead were absent, despite good habitat conditions. The presence of signal crayfish was likely to be a key factor in this regard and more crayfish were encountered in the small site than any fish species. Consequently, despite the proximity of the Blythe SSSI, the stretch of Hollywell Brook within the land required for the construction of the Proposed Scheme is unlikely to be colonised by bullhead.

Castle Bromwich and Bromford (CFA25)

River Tame SLINC

5.4.13 The site surveyed at the River Tame SLINC was relatively shallow and very fast flowing. This area was found to support a reasonably diverse community of fish species; however, the overall catch was relatively low. Further species were likely to be present immediately downstream of the survey site, where flow rates were visibly slower in deeper sections and more suitable to shoaling riverine species such as chub, dace and minnow but access to this section of the River Tame SLINC was restricted due to a live rail line.

[38]Perrow, M.R. and Côté, I. (1999), *The development of ecological requirements to inform the production of conservation objectives for bullhead and spined loach*. English Nature.

5.4.14 The fast flow of this section of the river could have influenced population densities. Most of the fish captured were either taking refuge within the beds of macrophytes present (predominantly stone loach) or sections of the banks with reduced flows due to erosion or the presence of vegetation (or roots) and / or debris (predominantly gudgeon and three-spined stickleback . Therefore despite the large area surveyed, suitable habitat for fish was found to be limited.

5.4.15 In addition, as only a single young-of-the-year fish was captured in the survey, the overall density estimate would be expected to increase by the autumn following recruitment. For example, the survey indicated that the surveyed stretch supported a good stone loach population, and with the presence of a dominant young-of-the-year age class, the density estimate would have been expected to be considerably greater.

5.4.16 Stone loach and bullhead, whilst requiring similar habitats and prey, co-exist in part due to their different feeding strategies[39]. The reason for the low numbers of bullhead present in the survey was unclear, particularly as the fast flowing waters over clear stony substrate appeared suitable habitat.

5.4.17 The survey of the River Tame SLINC did not appear to be compromised due to the site not being delimited by stop nets. Whilst reconnoitring the stretch of the river for a suitable site and safe access points, no shoaling species were observed in the shallow clear waters. Moreover, all the fish captured from within the survey area were caught from within the submerged macrophytes or in areas of reduced flow within the banks.

Washwood Heath to Curzon Street (CFA26)

5.4.18 No fisheries surveys were undertaken within this area, as no watercourses that crossed the land required for the construction of the Proposed Scheme were known or suspected of fisheries interest.

[39]Tomlinson, M. L. and Perrow, M.R. (2003), *The Ecology of the Bullhead. Conserving Natura 2000 Rivers Ecology Series No. 4.* English Nature, Peterborough.

6 References

Chadd, R. and Extence, C, (2004), *The conservation of freshwater macro-invertebrate populations: a community based classification scheme*. Aquatic Conservation: Marine and Freshwater. Ecosystems. 14: 597-624.

Daguet, C. French and G. Taylor, P. (2008), *The Odonata Red Data List for Great Britain*. JNCC, Peterborough.

Department for Environment, Food and Rural Affairs; Ponds, Pools and Lochans; http://adlib.everysite.co.uk/adlib/defra/content.aspx?doc=11588&id=11606; Accessed: 24 June 2013.

Environment Agency, (2011), River Tame Flood Risk Management Strategy, May 2011: Statement of Environmental Particulars, Environment Agency, Solihull.

Extence, C.A., Balbi, D.M. and Chadd, R. P. (1999). *River Flow Indexing Using British Benthic Macro-invertebrates: A Framework for Setting Hydroecological Objectives*. Regulated Rivers: Research and Management. 15: 543-574.

Extence, C.A., Chadd, R. P., England, J., Dunbar, M. J., Wood, P. J. and Taylor, E. D. (2013), *The Assessment of Fine Sediment Accumulation in Rivers Macro-invertebrate Community Response*. River Research and Applications. 29: 17–55.

Foster, G.N. (2010), *A review of the scarce and threatened Coleoptera of Great Britain Part 3 - Water beetles of Great Britain.* Species Status 1. Joint Nature Conservation Committee, Peterborough.

Hawkes H.A. (1997), *Origin and Development of the Biological Monitoring Working Party Score System.* Water Research 32 (3): 964-968.

Hyman, P.S., (1992), *A review of the scarce and threatened Coleoptera of Great Britain. Part I.* Joint Nature Conservation, Peterborough.

Maitland, P.S. (2000), Guide to Freshwater Fish of Britain and Europe. Hamlyn.

Natural England, *Site Name: River Blythe, Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended.* www.english-nature.org.uk/citation/citation_photo/1001772.pdf; Accessed: 2012

Palmer, M., Drake, M. and Stewart, N. (2013), *A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of grazing marsh ditch systems.* Version 6. Buglife.

Perrow, M.R. and Côté, I. (1999), *The development of ecological requirements to inform the production of conservation objectives for bullhead and spined loach.* English Nature.

Pisolkar, E. (2007), *Park Hall Farm, Birmingham – Freshwater Macro-invertebrate Survey.* Report by Pisolkar E, Environmental Consultant.

Pond Conservation, Rapid Assessment for Ponds;

http://www.pondconservation.org.uk/Surveys/npspsymmethods/rapidassessment; Accessed: 24 June 2013.

SEPA; *RICT,* http://rict.sepa.org.uk/; Accessed 21 August 2013.

Tomlinson, M.L. and Perrow, M.R. (2003), *The Ecology of the Bullhead.* Conserving Natura 2000 Rivers Ecology Series No. 4. English Nature, Peterborough.

Wright J.F., Sutcliffe D.W. and Furse M.T (eds) (2000), *Assessing the biological quality of fresh waters: RIVPACS and other techniques,* Freshwater Biological Association, Ambleside.